

Safety Enforcement Education

Final Report



City of Greensboro SafeLight Program

*Red Light Camera Program
Review and Analysis*



Prepared for:



Prepared by:



Kimley-Horn
and Associates, Inc.



August 2004

SafeLight

PIEDMONT

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Executive Summary

Red light running has become an issue in the United States with over 250,000 annual crashes at intersections attributed to red light running resulting in nearly 900 fatalities per year. The City of Greensboro, along with other municipalities in North Carolina, had experienced the effects of decreased safety due to red light running and set out to specifically address this problem. In 1999, there were 498 traffic accidents in Greensboro attributed to red light running that resulted in 274 personal injuries. In 2000, the City of Greensboro established SafeLight, a red light photo enforcement program with three main objectives:

1. Enhance safety at signalized intersections in Greensboro by reducing the frequency and/or severity of crashes caused by red light running
2. Provide an additional method of violation enforcement so that police can use resources to fulfill other objectives
3. Raise awareness of safe driving practices in Greensboro

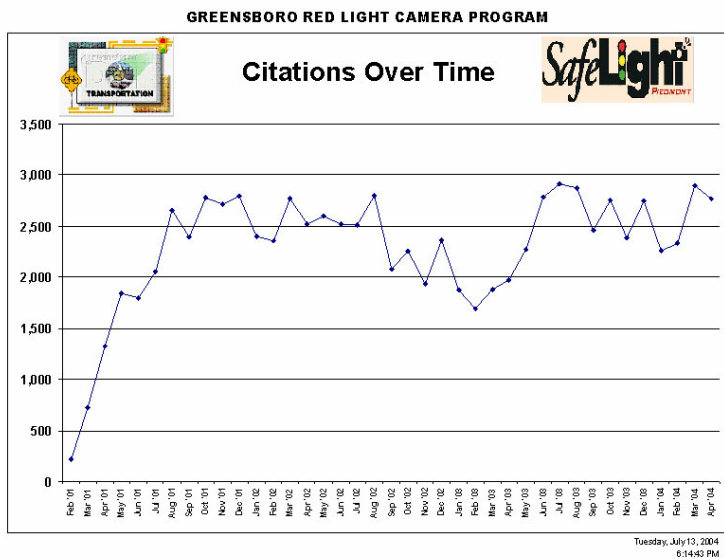
In October 2000, the City of Greensboro (the City) contracted with Peek Traffic Inc. to install and operate a red light photo enforcement system. In February 2001, Peek Traffic installed the first two automated red light cameras in the City of Greensboro. By November 2001, all 18 SafeLight cameras were operational and issuing red light running citations. With the exception of a few minor outages, the 18 cameras have been operational for nearly three years.

As the initial contract period between Greensboro and Peek Traffic drew to a close, the City contracted with Kimley-Horn and Associates, Inc. in early 2004 to perform a comprehensive program review of the SafeLight program and determine whether the program was meeting the City's objectives. The Greensboro program manager requested a program review and analysis that covered all aspects of the three objectives.

Objective 1 – Enhance Safety

The first objective of Greensboro's SafeLight program is to enhance safety at signalized intersections by reducing the instances of red light running and number of crashes caused by red light running. Angle accidents are among the most severe types of crashes that can occur at an intersection. There are only two ways vehicles can be traveling in opposition through an intersection controlled by a traffic signal. One is if the signal has lost power and is not functioning. In this case, the intersection technically is not operating under signal control and should function as a multi-way stop. The other is if one vehicle has violated the signal and has entered the intersection on a red indication.

Red light cameras are installed at intersections for the purpose of identifying and ticketing drivers violating the law by entering intersections on a red indication. The cameras were installed to supplement or replace customary police surveillance. In Greensboro and other North Carolina municipalities, the fine for this violation is \$50 if cited by photo enforcement. Considered a civil offense with no points assessed to the driver or vehicle owner, the citation is issued to the registered vehicle owner according to DMV records based on the license tag number. In contrast, drivers ticketed for running a red light by a law enforcement officer in North Carolina are assessed a fine of \$125



(consisting of a \$25 penalty and \$100 court costs) and three points on their driver's license.

Citation Summary

During the course of the program to-date, over 89,000 citations have been issued. Looking at numbers of citations issued each month in the graph of citations over time, the citation rates dipped the most between December 2002 and February 2003, although citations rose in the next several months in 2003. Summing citations annually and normalizing for the number of cameras and months each was active each year, average monthly citations declined 17% from 2001 to 2004.

Because enhanced safety is the first

objective of the SafeLight program, program managers expect the number of citations issued to decline over time as drivers begin to comply more often with the red indication. The greatest reductions in violations occurred during the first year of the program, which is likely a result of the public information campaign by the City and media attention during that first year. The average monthly citations issued in the first quarter of 2004 increased at most locations over the 2003 monthly averages.

Crash Summary

The crash data used for the before-and-after study of the red light photo enforcement program in Greensboro was prepared by the North Carolina Department of Transportation from the Traffic Engineering Accident Analysis System (TEAAS). The installation dates of each of the cameras were provided by Peek Traffic. Because NCDOT prepared the crash analysis, the last available crash data from the Department of Motor Vehicles in TEAAS is through September 30, 2003. To create the longest study period possible, NCDOT analysts determined the length of the after period for each intersection to be the length of time between the end of the adjustment period and September 30, 2003. The before period mirrors the after period in length so that the before-and-after crash statistics can be compared. The average daily traffic (ADT) for the median year was used to generate rates for all years so they can be compared to each other.

Overall, 15 of the 18 intersections saw reductions, or improvements, in at least one measure of effectiveness from the before period to the after period. While the statistical significance of such results may be debated due to the small number of locations and the small number of crashes at each intersection, the total number of crashes at all 18

Site ID	Site Name	Total	Rate	Angle	Rearend	SI	EPDO
601	Holden & Spring Garden	-25%	-29%	-36%	-23%	19%	-10%
602	Wendover & English	4%	-2%	-20%	26%	-17%	-13%
603	Battleground & Brassfield	9%	2%	-16%	78%	37%	49%
604	High Point Rd. & Pinecroft	17%	10%	28%	23%	-15%	0%
605	Wendover & Church	55%	45%	53%	64%	0%	55%
606	Holden & Wendover	-20%	-25%	0%	-23%	21%	-3%
607	Randleman & Florida	-11%	-16%	-14%	14%	-41%	-48%
608	Randleman & Creek Ridge	-21%	-25%	-29%	12%	24%	-2%
609	Battleground & Pisgah Church	-37%	-40%	-70%	-30%	-33%	-58%
610	Holden & Pinecroft	80%	69%	100%	100%	313%	644%
611	High Point Rd. & Merritt	-34%	-34%	-35%	-33%	29%	-15%
612	Church & Cone	4%	-2%	33%	-8%	-9%	-5%
613	Battleground & Cone	37%	29%	40%	28%	-21%	7%
614	Wendover & Big Tree	-11%	-16%	-32%	-3%	-25%	-33%
615	Freeman Mill & Coliseum	-41%	-44%	-53%	-30%	-45%	-68%
616	Spring & Friendly	-24%	-28%	-15%	-75%	108%	58%
617	Wendover & Hill	48%	39%	-60%	63%	-1%	46%
618	Wendover & Bridford	6%	0%	18%	15%	3%	9%
TOTAL		-4%	-14%	8%	2%	-2%	

intersections went down by 4% from 776 to 745 with a standard deviation of 0.049, and the number of angle crashes – usually the more severe crash type – went down by 14% from 309 to 265 with a standard deviation of 0.071.



Objective 1 Findings

The first objective of enhancing safety has been achieved. The analysis shows a 4% reduction in total crashes and a 14% reduction in angle crashes during the study period from an equivalent before period. The rates of citations issued for the total program decreased 17% from 2001 to April 2004, and several of the intersections saw significant reductions in citations from inception through December 2003.

Objective 2 – Provide Additional Enforcement

The second objective of Greensboro's SafeLight program is to provide photo enforcement as an additional method of violation enforcement. The benefit to Greensboro Police Department (GPD) traffic enforcement officers would be that they could use their limited resources elsewhere to make the City safer. GPD likes the fact that the cameras are able to clearly record motorists who are breaking the law. In some cases, the police have used the camera images to identify hit and run vehicles.

GPD believes that the existence of the 18 red light running cameras in Greensboro aids the officers in monitoring approaches at intersections and enforcing traffic laws. To allow the GPD to benefit from the presence of photo enforcement, traffic enforcement officers as a practice do not monitor photo enforced intersection approaches for red light running violations. This allows these officers to focus more time on monitoring the other approaches at these intersections or at other intersections and monitoring for other types of violations.



In 2000, the year before the red light cameras were installed in Greensboro, GPD issued 1,446 red light running citations between January 1 and December 31. In 2003, the most recent calendar year in which all 18 cameras were operational, GPD issued 1,043 red light running citations. This is a decrease of 403 citations or a 28% reduction in citations issued from 2000 to 2003.

If an officer takes 10 minutes to issue a citation, as reported by the GPD, the 89,000 citations issued by the SafeLight Program since inception would have taken nearly 15,000 hours of officers' time. This would equate to 2-3 additional officers doing nothing but issuing red light running citations full time for 3 years. At a reported cost of \$21.13 per hour for a law enforcement officer's salary and benefits, it would have cost the city over \$300,000 to have officers issue the same number of citations as the cameras have over the program duration. Moreover, had the citations been issued by a law enforcement officer rather than through the SafeLight program, they would have carried points and a fine and court costs of \$125, which also would have resulted in additional costs to the citizens of Greensboro.

Objective 2 Findings

The second objective of providing additional enforcement has been achieved by contracting with Peek Traffic to install and maintain 18 red light cameras. The Greensboro Police Department reported they do not enforce red light running on photo enforced intersection approaches. This gives the Department time to focus on other locations and other moving violations.

Objective 3 – Raise Awareness

The third objective of Greensboro's SafeLight program is to raise awareness of safe driving practices in Greensboro. To evaluate the degree to which the program is meeting this objective, it is necessary to investigate the methods employed by the City to educate the public and how the program has been perceived in the media.

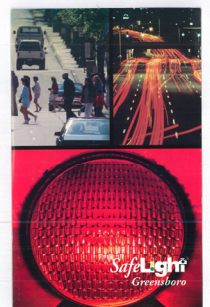
Media Review Summary

Individual citizens and some elected officials have taken issue with red light photo enforcement programs across the country, and the media has aired or printed their viewpoints in several instances. A primary theme throughout several articles is the perception that government agencies are providing a mechanism for private companies to profit at the expense of its citizens and that the point of the programs is to generate revenue rather than to improve safety. Some imply that system operators have chosen locations and adjusted clearance times to maximize revenue. The right to due process, violation of privacy, the presumption of guilt, and the fining of vehicle owners without proof of driver identification are other themes seen in news articles critical of photo enforcement programs. Articles portraying the benefits of red light camera programs report the reduction in crashes and decrease in citations issued. Articles also report what other safety improvements have benefited the community with revenues from the paid citations. Many, if not all, systems have been portrayed positively and negatively by the media at one time or another. In the Triad region, many news reports have centered on the issues raised by the High Point lawsuit.

Program Outreach Summary

Before the first camera was installed, the City of Greensboro had begun a planned outreach campaign to educate the citizens about the SafeLight program. The campaign focused on reaching the public through the media and through direct contact.

The City issued press releases that introduced the SafeLight program and then issued a press release when each red light camera was turned on. Many local media outlets picked up on the press releases and reported on the SafeLight program status. In addition, the City used its own community access Channel 13 to reach the public. In cooperation with the SafeLight Charlotte program, a fifteen minute video was produced that explained the SafeLight program and its operations. In 2002, as the cameras were being installed, this video was shown eight times a day on Channel 13 for about six months. The City also went directly to the citizens to educate them on the SafeLight program. A flyer explaining the program was distributed with water bills mailed to citizens in 2002 reaching nearly 90,000 Greensboro residents. In addition, the program provided about 5,000 SafeLight brochures, 10,000 SafeLight bumper stickers, and 10,000 children's flashing Safelight buttons for



distribution to Greensboro citizens. Finally, City staff met with the public at 25 civic group meetings to give a presentation on the SafeLight program and at “City Hall in the Mall” events.

Objective 3 Findings

The City has met the third objective of raising awareness of safe driving practices by actively participating in marketing the program. The City has distributed several types of marketing materials for the SafeLight program and has been open and cooperative with the media regarding the program. In addition, funds from SafeLight have gone toward other safe driving programs in Greensboro.

Program Compliance with State and Local Laws

The operation of Greensboro’s SafeLight program is fully compliant with state and local laws. In fact, the program has extended the payment window for citations beyond the period stated in the Greensboro ordinance. In January 2003 the City made a policy decision to extend the period for an individual to pay or appeal a citation from 21 to 28 days. The purpose of this change was to be more consistent with other City payment processes and hopefully increase the collection rate for penalties.

The North Carolina General Statute allowing the operation of red light cameras requires that the clearance intervals be calculated by methods that are contained in the Design Manual published by the Signals and Geometric Section of NCDOT. The yellow change and red clearance intervals are used in traffic signals to allow motorists approaching the intersection to have sufficient time to clear the intersection at the termination of the green before displaying a green indication to the conflicting traffic. The amount of time given is a function of the posted or average speed, the grade of the approach, and the width of the intersection that vehicles must traverse. The yellow change and red clearance intervals at the 18 SafeLight intersections comply with the NCDOT guidelines.

Program Compliance with Federal Guidelines

In 2003, the Federal Highway Administration (FHWA) published a report on red light cameras titled, *Guidance for Using Red Light Cameras*. The report was in response to the rapid deployment of red light photo enforcement programs in the United States and the often inconsistent implementation of these programs. The FHWA presented proven and effective practices to provide guidance in addressing red light runners and how to implement a red light photo enforcement program if deemed beneficial.

The guidelines were published by the FHWA two years after Greensboro had its first red light camera installed and operational. Nevertheless, Greensboro’s red light photo enforcement program adheres to the majority of the guidelines. One area where the Greensboro program differs from the FHWA guidelines is system procurement and contracting. The FHWA report suggests that when a private contractor is responsible for processing citations, the contractor’s compensation should not be based on the number of citations issued (i.e., receiving a percentage of the citation fines). The FHWA believes this type of payment arrangement to be a conflict of interest with the potential for impairing the contractor’s judgment regarding installation and operation of the red light camera system. The City has addressed this concern by reducing the per citation

payment as the number of citations increases, which limits the contractor's proceeds, and by having a system of checks and balances limiting independent decisions made by the contractor about system operations.

Program Financial Review

According to the City, the revenue collected from the more than 89,000 citations issued during the three-year SafeLight program has exceeded \$3.4 million. During this time, Greensboro paid Peek Traffic approximately \$2.3 million to operate the program according to the payment schedule in the contract. Greensboro spent nearly \$150,000 on adjudication for those who appealed the citations and paid over \$8,000 to the Department of Motor Vehicles to allow Peek Traffic to access vehicle registration records.

With the remaining funds from the citations, the City has financed safety programs. The City helped to fund the Neighborhood Speed Watch and Pace Car program. These safety programs attempt to lower speeds in the City through various initiatives.

Specifically, some of the photo enforcement revenues were spent purchasing radar/display units for citizens to use in their neighborhoods to help combat speeding. The City also purchased 30 portable generators to power traffic signals during power outages that can occur due to storm events. Providing temporary power to signals in critical areas will help maintain order and minimize congestion and crashes during prolonged power outages. The City currently retains a balance of over \$900,000 that will be used to fund safety improvements.

To operate photo enforcement systems, contractors are generally paid either on a lump sum or per-citation basis. Lump sum payments reduce the perception that systems are designed to maximize citations and revenue but per-citation payments ensure the system is well maintained and operating effectively by tying the revenue to issuance of citations.

In Greensboro, which has a per-citation payment contract, the City selected the sites and set the clearance times. The system includes a 0.2-second grace period after the light changes from yellow to red before a violation is considered to have occurred. Finally, the percentage of payment to the contractor from each citation decreases as the number of citations increases. The contractor has little ability or incentive to make changes to increase the numbers of valid citations issued.

City of Greensboro
RED LIGHT CAMERA PROGRAM
4915 Piedmont Parkway, Suite 108, Jamestown, NC 27282
(336) 834-9555

SafeLight
Piedmont

MAIL DATE: [REDACTED]
Payment Due Date: 07/26/2004
If paid after due date

NOTICE OF CITATION
Citation Number 633885
Amount Due: \$50.00
Amount Paid: \$100.00

Internet Password: [REDACTED]
Amount Paid: \$

Greensboro, NC 27401

Contact us on the Internet for citation information and payments at:
<https://onlineviolation.com/greensboronc>

City of Greensboro
4915 Piedmont Parkway, Suite 108
Jamestown, NC 27282

Citation Number: 633885
Plate: [REDACTED]

On 06/23/2004 at 12:59 PM your vehicle was photographed (copies are shown to the right) entering an intersection in which the traffic signal was red, in violation of Greensboro City Code Section 16.58. The civil penalty for this violation is \$50.00. No points will be assessed against your driving record or insurance as a result of this violation. Please see reverse side for payment options and for a description of the information in the Data Block shown above the photographs.

This program has been initiated to increase roadway safety, reduce red light violations and prevent injuries. If you have any questions regarding this citation, please visit our Internet site or call the office at (336) 834-9555.


Important Notice: Failure to pay the civil fine by the due date shown above will result in an additional late penalty of \$50.00. Request for appeals and transfer of responsibility must also be received by the due date above or your right to appeal will be waived. For your convenience, you may pay or appeal your citation via the internet at <https://onlineviolation.com/greensboronc>. Please be sure to use the internet password provided above to access your citation.

Amber Time	Red Time	Vehicle Tag No
4.00	.20	[REDACTED]

Date/Time	Location of Violation
06/23/2004 12:59 PM	BATTLEGROUND AND CONE

**FOR A SAFER COMMUNITY
STOP ON RED**

07/30/2004 Reprint



Conclusions and Recommendations

Currently, the SafeLight program has been operational for three years and the City is considering renewing the contract to provide red light photo enforcement in Greensboro. The City is meeting the objectives it set for the program to date. Based on the findings in this report, the following items are recommendations for the City to consider as they enter the next phase of the SafeLight program.

- When renewing the contract with the red light camera provider, consider a lump sum payment schedule rather than a per-citation payment schedule. This may eliminate perceptions that the SafeLight program has the sole purpose of generating revenue.
- Revisit the selection of intersections with red light cameras. Locations where crashes and red light violations are not decreasing do not meet the first objective of the program and may be more suited for alternate engineering or enforcement countermeasures to enhance safety. Also, consider using updated crash statistics and solicit input from the Police Department to identify potential new locations for red light cameras.
- Continue to invest in program outreach to educate the public about the SafeLight program. The program could target new drivers through presentations at high schools and driver education classes. The program could provide annual reports that highlight the benefits of the program and the benefits of the revenue that is generated. Finally, Greensboro staff should work with local media to publicize the benefits of the system.

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Appendices G through L are provided under separate cover.*

1 INTRODUCTION

1.1 PROGRAM BACKGROUND

Red light running has become a problem in the United States with over 250,000 annual crashes at intersections attributed to red light running resulting in nearly 900 fatalities per year. The City of Greensboro, along with other municipalities in the State of North Carolina, has experienced the effects of decreased safety due to red light running and set out to specifically address this problem. In 1999 there were 498 traffic accidents caused by red light running that resulted in 274 personal injuries. In 2000, the City of Greensboro established SafeLight, a red light photo enforcement program in their city with three main objectives:

1. Enhance safety at signalized intersections in Greensboro by reducing the frequency and/or severity of crashes caused by red light running
2. Provide an additional method of violation enforcement so that police can use resources to fulfill other objectives
3. Raise awareness of safe driving practices in Greensboro

In October 2000, the City of Greensboro (the City) contracted with Peek Traffic Inc. to install and operate a red light photo enforcement system. In February 2001, Peek Traffic installed the first two automated red light camera in the City of Greensboro. By November 2001 all 18 SafeLight cameras were operational and issuing red light running citations. With the exception of a few minor outages, the 18 cameras have been operational for nearly three years.

The 18 intersections were chosen by weighing factors including:

- Number of observed red light violations
- Ranking of the intersection based on crash history
- Appearance of the location on a Greensboro Police Department (GPD) high accident list
- Lack of prohibitive construction issues

The selection committee consisting of City and GPD staff made recommendations of the intersections they felt would most benefit from red light photo enforcement. After compiling the list of intersections, Peek Traffic commenced field studies to measure actual red light running violations at each location. Peek Traffic also investigated the layout and geometry of the intersections to determine if a red light camera could be installed effectively at the location.

Following the field study, Peek Traffic and the City, working together, selected the final intersections from the list of intersections recommended for installing cameras. Each intersection selected by Peek Traffic had been identified by the City as an intersection where the perceived safety by the public would increase due to the installation of a red light camera. **Table 1** lists the Greensboro SafeLight camera locations and the approach monitored at each intersection. **Figure 1** shows the camera locations on a map of Greensboro.

City of Greensboro - Red Light Camera Locations

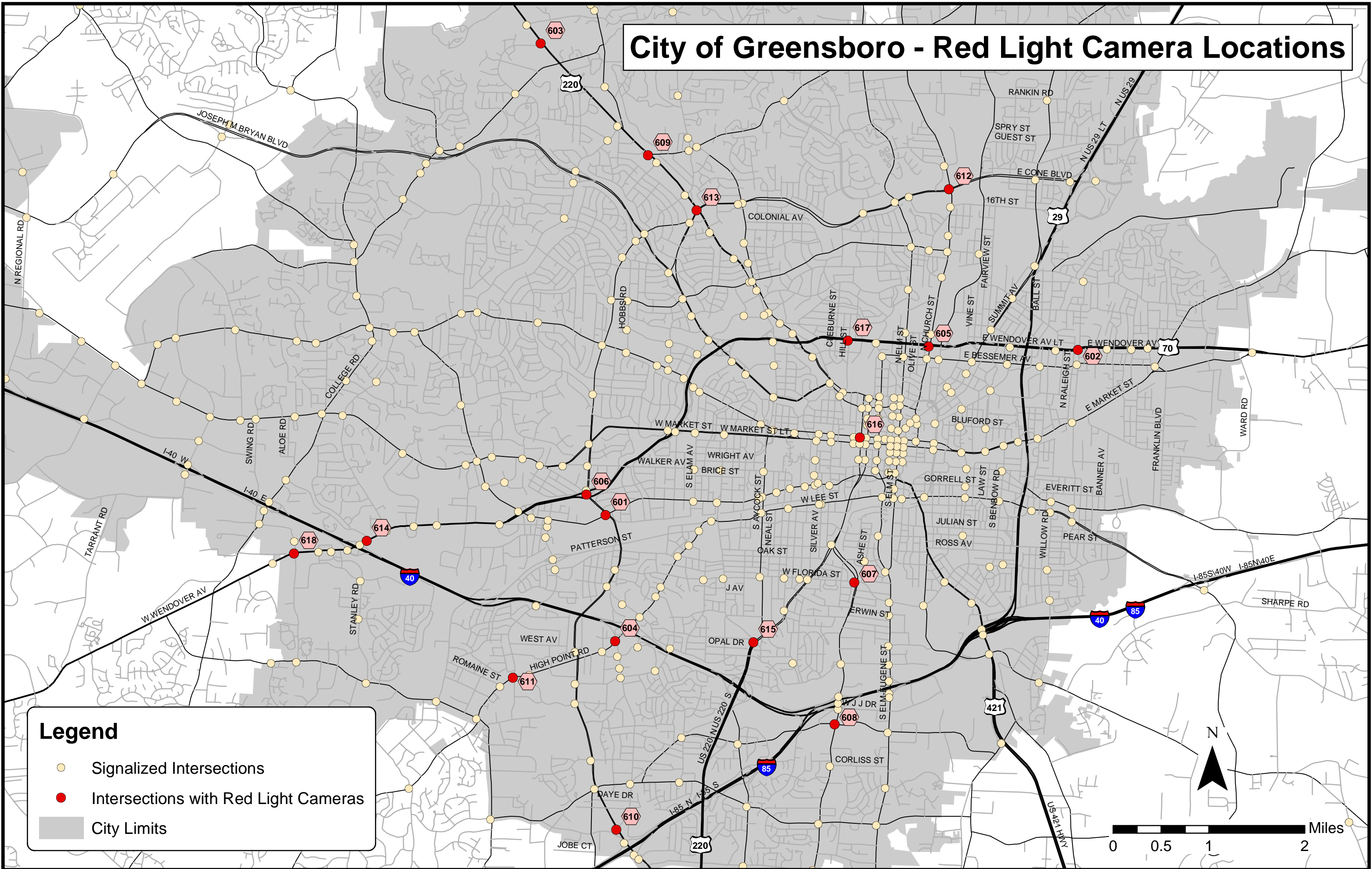


Table 1. Greensboro SafeLight Camera Locations

Site Number	Intersection	Monitored Approach
601	Holden Road & Spring Garden Street	Southbound
602	Wendover Avenue & English Street	Westbound
603	Battleground Avenue & Brassfield Road	Northbound
604	High Point Road & Pinecroft Road	Eastbound
605	Wendover Avenue & Church Street	Westbound
606	Holden Road & Wendover Avenue	Northbound
607	Randleman Road & Florida Street	Northbound
608	Randleman Road & Creek Ridge Road	Northbound
609	Battleground Avenue & Pisgah Church Road	Southbound
610	Holden Road & Pinecroft Road	Southbound
611	High Point Road & Merritt Drive	Eastbound
612	Cone Boulevard & Church Street	Westbound
613	Battleground Avenue & Cone Boulevard	Northbound
614	Wendover Avenue & Big Tree Way	Westbound
615	Freeman Mill Road & Coliseum Boulevard	Northbound
616	Friendly Avenue & Spring Street	Southbound
617	Wendover Avenue & Hill Street	Eastbound
618	Wendover Avenue & Bridford Parkway	Westbound

The cameras used at the intersections operate in a manner similar to most other red light photo enforcement systems deployed in the United States. The camera system does not operate continuously, but only activates when the traffic signal turns red. Vehicle detectors in the roadway sense vehicles and record their speed at the stop line of the intersection. If they detect a vehicle moving at a speed of 13 miles per hour or higher after the signal light has been red for over 2/10 of a second, the camera is directed to take pictures of the vehicle. The first picture taken is of the vehicle at the stop line showing the red light of the signal. The second picture shows the vehicle with its back wheels past the stop line during the red phase. Finally, a third picture is taken that is directed at the license plate of the violating vehicle. All of the pictures taken are stored in a digital format in the camera. The pictures are downloaded daily for review using phone lines to the Peek Traffic office.

At the Peek Traffic office, all pictures are reviewed in a timely manner. Two Peek reviewers inspect each set of photos to determine if an actual red light violation had occurred and if the license plate is decipherable. They then access the DMV database to verify the vehicle registration matches the vehicle shown on the citation photos. Next, the possible violations are forwarded to the City program manager. A third reviewer at the City also determines if a violation occurred and makes the final decision on the issuance of a citation. All reviewers follow specific guidelines and procedures. According to the City's printed documentation for all reviewers, the criteria for a valid citation are as follows:

The first picture must clearly show:

- The vehicle prior to touching the painted stop line on the roadway.

- That the governing traffic signal has the red phase illuminated.

The second picture must clearly show:

- That the same vehicle entered the intersection during the red phase showing the vehicle's back wheels beyond the stop line.

The third picture must clearly show:

- The vehicle's license plate readable to the naked eye.
- That the license plate image was created from the same vehicle violation images.

In general, for a valid citation the following must be true:

- The data box superimposed on the photo in a manner that does not block key information.
- All text and characters of the data box are readable.
- That there are no visible factors which would invalidate the violation.
- That the name and complete mailing address of the registered owner of the vehicle can be obtained from the appropriate motor vehicle administration.
- That the vehicle description obtained from the motor vehicle administration appears to match the vehicle photographed in the violation.
- That the red signal indication is illuminated in the color red on all citations.

After identifying a valid violation, a citation is processed by the contractor and mailed to the registered owner of the violating vehicle. The citation is printed in color showing all three photographs and accompanying data. **Appendix A** shows a sample citation. A final review of the citation verifies that the DMV information matches the license plate shown on the citation and that all photos are legible.

Fines from the citations are paid to the City of Greensboro and can be paid in person at the SafeLight office or City Government Building, through the mail, over the phone, or online. Payments can be made by cash, check, or credit card. The citation fine is \$50. A late fee of an additional \$50 is charged if the fine is not paid before the due date, which is 28 days after the mailing date of the citation. The decision to extend the original due date of 21 days is addressed in **Section 5.5**.

After a citation is issued, it can be appealed by the vehicle owner by following directions printed on the back of the citation and returning the appeal form sent with the citation. The appeal must be received by the citation due date for the request to be accepted. All appeals are reviewed by local, state bar-certified attorneys during scheduled hearings. The program was initiated with 5 different adjudicators, but currently uses 3 adjudicators on a rotating schedule to hear appeals. These adjudicators have all completed a training session for the program and they are paid on a per-appeal basis by the City from SafeLight program revenues, receiving the same amount regardless of the outcome of the appeal. The owner may attend the appeal hearing in person or submit documents and letters supporting the appeal. All appeal decisions by the adjudicators are considered final.

1.2 PROGRAM OBJECTIVES

As stated above, Greensboro's SafeLight program was developed to meet three objectives:

- Enhance safety at signalized intersections by reducing the incidents of red light running and number of crashes caused by red light running
- Provide an additional method of violation enforcement so that police can use resources to fulfill other objectives
- Raise awareness of safe driving practices in Greensboro

As the initial contract period between Greensboro and Peek Traffic drew to a close, the City contracted with Kimley-Horn and Associates, Inc. in early 2004 to perform a review of the SafeLight program and determine whether the program was meeting the City's objectives. The Greensboro program manager requested a program review and analysis that covered all aspects of the three objectives. Aspects of the three objectives reviewed and presented in this report include:

- A statistical review of the number and trend of red light running citations issued by the photo enforcement system.
- A safety analysis of the numbers of crashes and rates at the program intersections before and after the cameras were installed.
- A literature review of other reports evaluating red light photo enforcement programs worldwide as well as guidelines published by national transportation and safety agencies.
- A programmatic review including review of case law and legal issues related to Greensboro and other red light photo enforcement programs.
- A review of news reports about red light photo enforcement programs in Greensboro and elsewhere.
- An engineering investigation of each of the project intersections to ascertain geometric characteristics of each location.
- A comparison of the policies and practices of Greensboro's program to other programs in North Carolina.

1.3 FINDINGS

The first objective of enhancing safety has been achieved. The analysis shows a 4% reduction in total crashes and a 14% reduction in angle crashes during the study period from an equivalent before period. From 2001 to 2004, the average monthly citation rates have declined 17%.

The second objective of providing additional enforcement has been by contracting with Peek Traffic to install and maintain 18 red light cameras. The Greensboro Police Department reported they do not enforce red light running on photo enforced intersection approaches. This gives the Department time to focus on other locations and other moving violation.

The City has met the third objective of raising awareness of safe driving practices by actively participating in marketing the program. The City has distributed several types of marketing materials for the SafeLight program and has been open and cooperative with

the media regarding the program. In addition, funds from SafeLight have gone toward other safe driving programs in Greensboro.

2 OBJECTIVE 1 – ENHANCE SAFETY

The first objective of Greensboro's SafeLight program is to enhance safety at signalized intersections by reducing the instances of red light running and number of crashes caused by red light running. Angle accidents are among the most severe types of crashes that can occur at an intersection. There are only two ways vehicles can be traveling in opposition to each other at an intersection controlled by a traffic signal. One is if the signal has lost power and is not functioning. In this case, the intersection technically is not operating under signal control and should function as a multi-way stop. The other is if one vehicle has violated the signal and has entered the intersection on a red indication.

To evaluate the program's effectiveness in meeting this objective, it is important to analyze the trends in citation frequency over time from the program inception. One can infer that as red light citations decline, the numbers of violations are declining. As violations decrease, the likelihood of conflicts or chances for conflicts decreases, the likelihood of angle crashes decreases and the safety of the intersection increases. It is also important to analyze the trends in the number and severity of crashes before and after the program inception to verify whether crashes have decreased after the program was implemented. Finally, this chapter includes a literature review to present findings from other studies on the subject of enhancing safety and a field inventory to investigate features of the intersections chosen for the program that may affect safety.

2.1 CITATION AND VIOLATION ANALYSIS

Red light cameras are installed at intersections for the purpose of catching and ticketing drivers violating the law by entering intersections on a red indication. The cameras supplement or replace customary police surveillance. In Greensboro and other North Carolina municipalities, the fine for this violation is \$50 if caught by photo enforcement. A civil offense with no points assessed to the driver or vehicle owner, the citation is issued to the registered vehicle owner according to DMV records based on the license tag number. Comparatively, if a driver is caught running a red light by a law enforcement officer in North Carolina, he or she is assessed a fine of \$125 (which consists of a \$25 penalty and \$100 court costs) and three points on his or her driver's license.

2.1.1 CITATION TRENDS

The first camera installed was operational in 2001 for eleven months and the last camera installed was operational for one and a half months in 2001. With a total number of citations in 2001 of 21,304, the average monthly citations issued in 2001 was 3,080 weighting each location by the length of time it was in service. In 2002, the average citations issued per month was 2,425, with a total number of 29,109 citations. A total 28,637 citations in 2003 yields an average of 2,386 citations per month. In 2004, citation data was provided through the end of April with a total of 10,261 citations and 2,565 average citations per month. Overall, the number of citations issued was 89,311. Due to driver variability, inattention, and impairment, the number of citations, or violations, will never be zero. **Table 2** illustrates the average annual monthly citations issued, which was determined by dividing the total citations issued each year at each location by the number of months the camera was active that year at that location and summing the results of all 18 locations for each year.

Table 2. Average Annual Monthly Citations Issued

Year	Avg. Monthly Citations	% decrease from 2001
2001	3,080	---
2002	2,425	21%
2003	2,386	22.5%
2004	2,565	17%

Table 3 illustrates the numbers of citations issued by location and by year. Another way to illustrate the trends in citations is to graph the actual monthly citations both on a total program and per location basis. **Figure 2** illustrates the sum of citations issued over time for all 18 intersections. **Figure 3** illustrates citations issued over time for each individual intersection. Because each intersection is unique, trends in citation rates for each vary. When averaged over an entire year, the numbers show that citation rates have decreased since the first year the cameras were activated. The month-by-month graph shows that it is not a steady decline but rather fluctuates from month to month over time.

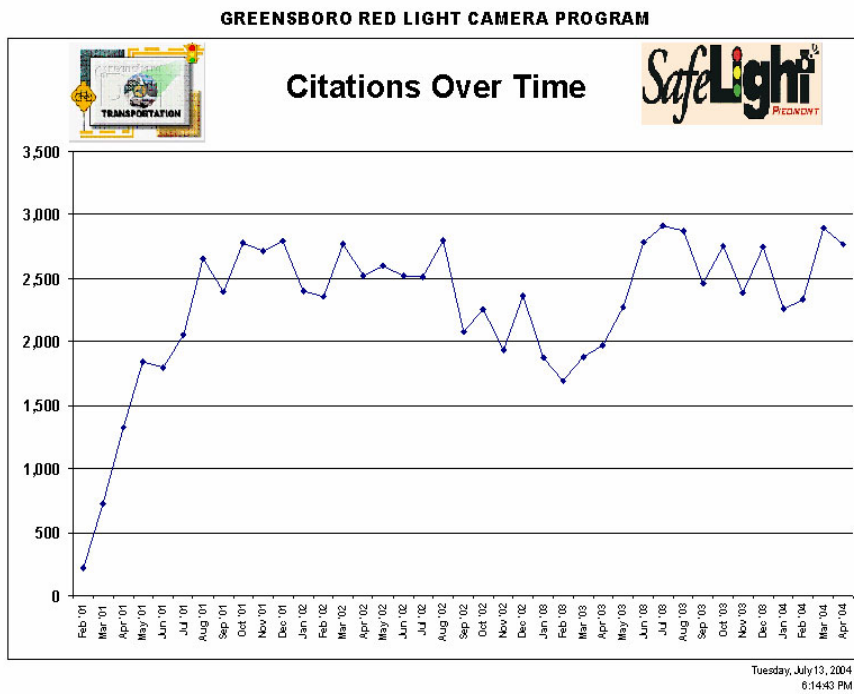
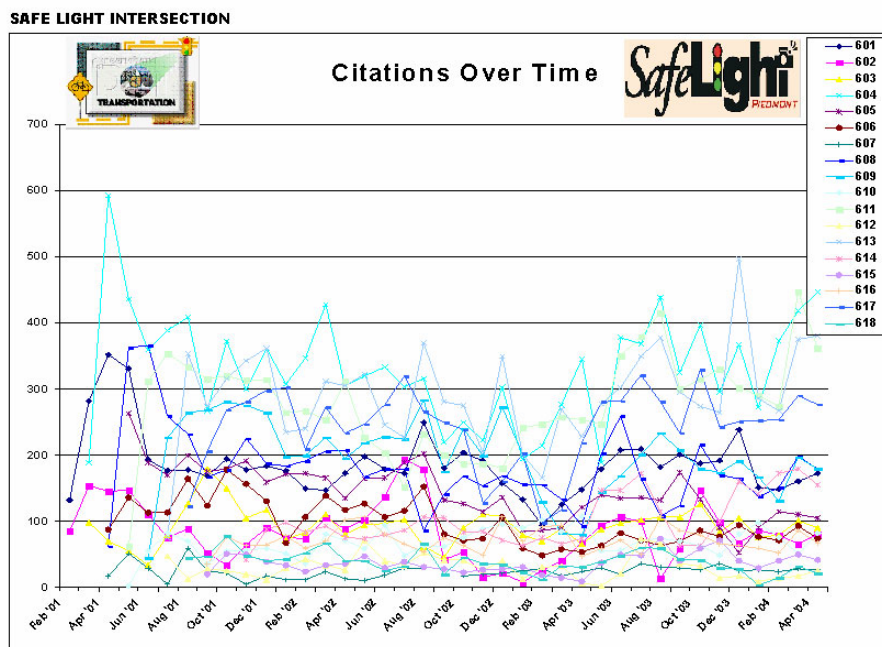
No one month of the year appears to be worse than another, but more citations are issued on Friday than any other day of the week. Sunday has the lowest number of citations issued. The period of 2:00 PM – 4:00 PM sees the largest number of violators with nearly 15,000 of the 89,000 total citations issued during this 2 hour period every afternoon. The fewest number of violations occur between 4:00 AM and 5:00 AM. This is also typically the time of day with the lowest traffic volumes.

Table 3. Citations Issued by Location and Year

Site Number	Intersection	2001*	2002	2003	2004**	Total
601	Holden Road & Spring Garden Street	2,367	2,179	2,098	633	7,277
602	Wendover Avenue & English Street	1,049	1,091	827	312	3,279
603	Battleground Avenue & Brassfield Road	1,017	1,058	1,120	346	3,541
604	High Point Road & Pinecroft Road	3,673	3,652	3,786	1,509	12,620
605	Wendover Avenue & Church Street	1,526	1,875	1,378	421	5,200
606	Holden Road & Wendover Avenue	1,204	1,266	828	315	3,613
607	Randleman Road & Florida Street	232	212	331	106	881
608	Randleman Road & Creek Ridge Road	2,039	2,035	1,944	667	6,685
609	Battleground Avenue & Pisgah Church Road	1,624	2,660	1,990	675	6,949
610	Holden Road & Pinecroft Road	419	828	904	307	2,458
611	High Point Road & Merritt Drive	2,321	2,666	3,637	1,373	9,997
612	Cone Boulevard & Church Street	146	483	351	68	1,048
613	Battleground Avenue & Cone Boulevard	1,723	3,363	3,504	1,309	9,899
614	Wendover Avenue & Big Tree Way	129	1,041	1,247	648	3,065
615	Freeman Mill Road & Coliseum Boulevard	160	381	499	161	1,201
616	Friendly Avenue & Spring Street	240	911	885	265	2,301
617	Wendover Avenue & Hill Street	1,176	2,903	2,858	1,072	8,009
618	Wendover Avenue & Bridford Parkway	259	505	450	74	1,288
TOTAL:		21,304	29,109	28,637	10,261	89,311

* Number of active months for each camera varies. Activation dates of each camera are shown in **Table 5**.

** Consists of January through April.

Figure 2. Citations over Time**Figure 3. Citations over Time per Intersection**

Appendix B provides additional information including graphs illustrating the number of citations issued by month and year for the total program and for each intersection, rates of appeals to citations, rates of payment of citations, appeals upheld versus overturned, etc.

2.1.2 APPEALED AND PAID CITATION TRENDS

In the first year, 3.1 percent of citations issued were appealed. In 2002 and 2003, 3.9% of citations were appealed. In the first 4 months of 2004 for which data was available, 2.17% of citations were appealed. During the program, less than a quarter of the citations appealed were overturned.

From the citations issued, less than 25% remain unpaid each year according to records provided by Peek Traffic. Of the total number of citations paid, about 90% were paid within the due date and the remainder was paid with a late fee.

2.1.3 CITATION SUMMARY

Overall, the citation rates dipped between December 2002 and February 2003 by the greatest amount, although citations rose in the next several months in 2003. Overall, citations declined 17% from 2001 to 2004. Because enhanced safety is the first objective of the SafeLight program, one would expect the number of citations issued to decline over time as drivers begin to comply more often with the red indication. The greatest reductions in violations occurred during the first year of the program. The average monthly citations issued in 2004 increased at most locations over the 2003 monthly averages.

A reduction in month to month citations indicates a reduction in vehicles running red lights. This could indicate a reduction in conflicts, thereby a rise in the level of safety at the program intersections because the potential for frontal angle and left-turn crashes has been reduced. While a 17% reduction indicates success with the photo enforcement program, some changes may yield even greater results.

Perhaps, some drivers are not aware of the program. If the public service announcements are increased, more citizens may become aware of the dangers of the unlawful practice of running red lights and the fines associated at 18 Greensboro SafeLight intersections. Perhaps the red light runners are unfamiliar (non-local) drivers who have not been exposed to previous or current media campaigns. Constraints on times for cycle lengths and main street green times may force some drivers to be faced with a yellow indication at or near the point where it is difficult to choose between stopping and going. However, all yellow times are consistent for all timing plans at an intersection and are in compliance with the current standards for minimum yellow change intervals set by NCDOT in the Design Manual published by the Signals and Geometric Section.

Finally, it may be the case that an outstanding civil citation of a \$50 fine is an acceptable penalty to some drivers and is not enough to alter driver behavior. This is further shown by the repeat violator report provided by Peek Traffic and summarized in **Table 4**. The

report states that over 3,000 vehicles were issued multiple citations over the 19 month period.

Table 4. SafeLight Duplicate Violators Summary

# of Citations*	# of Vehicles
7	4
6	5
5	21
4	57
3	367
2	2,657
TOTAL	3,111

*From February 15, 2002 to September 30, 2003
as provided by Peek Traffic

While overall citation rates are falling for the program, **Table 4** above illustrates the fact that there are still habitual offenders. With more than 3,000 repeat citations out of a total of 65,000 citations issued during that time frame, the statistics indicate that 5% of the violators may not be affected by the cameras.

2.2 SAFETY ANALYSIS

Evaluating the change in crash rates over time is a method to express the safety of a location over time. This section will present the various methodologies available for analyzing crash statistics; discuss the method chosen and how the evaluation was undertaken. Next, the results of the evaluation are presented and discussed. At the inception of the study, the expectation was that crashes would have decreased over time during the photo enforcement program indicating a rise in safety in the area.

2.2.1 CRASH EVALUATION METHODOLOGY

There are numerous ways to evaluate the crash history of the 18 SafeLight intersections in Greensboro. Of the many methodologies used, each has benefits and drawbacks for analyzing crash statistics. To begin the crash evaluation for this program, it is important to provide an overview of the various ways of approaching the analysis.

2.2.2 EDUCATIONAL BACKGROUND

Analysis of highway crashes originated with laboratory experiments. Unlike the sterile environment of a laboratory, however, highways full of traffic are uncontrolled, non-sterile environments. “Experiments” on “treated” versus “control” populations are not possible in the field of highway safety.

In the highway safety business, specific treatments typically are applied to specific locations due to a perceived safety deficit at that location. To be a true experiment, locations would have to be randomly chosen; but safety engineers do not install safety countermeasures such as guardrail and traffic signals randomly. So for the treated sites, the recent crash history should be higher than that of the comparison sites. It should be

difficult to find untreated comparison sites because not treating locations with similarly high recent crash histories would be considered irresponsible.

Also in laboratory-type experiments, control populations are untouched and unaffected by the particular treatment. While some spot safety improvements, such as traffic signals and guardrail, are specific to a particular site and other nearby sites would be unaffected by the treatment, this is not true for other types of treatments. Public campaigns to improve safe driving practices - such as the popular “click it or ticket” and “booze it and lose it” - target the drivers rather than specific locations, thereby affecting all areas where motorists drive.

Red light photo enforcement programs are a hybrid of the spot safety type projects and the public campaigns. Cameras are installed at intersections chosen specifically for their crash and violation histories, but the application of a photo enforcement program on a community has a much larger impact than each of the individual cameras.

If the program includes a strong media or public relations campaign including a large blitz-type advertisement or constant advertisements in various markets during the entire course of the program, or even if there are numerous monitored intersections on heavily traveled commuter corridors, the drivers in Greensboro are likely to react differently to red lights at all intersections in the city, not just the monitored ones. For this reason, there may not be true control locations within the city limits. If the reviewer were to choose a “treatment and control” type of crash evaluation, sites in a similar city (one not subject to monitoring by red light cameras) would be recommended over sites within Greensboro.

Besides the laboratory-based treatment versus control evaluation method, another method of evaluation in statistical analysis is to compare a “before” treatment time frame to an “after” treatment time frame. The major fallacy with this type of evaluation is a phenomenon called regression to the mean. Regression to the mean is the tendency of numbers of crashes to fluctuate around an average, or mean, number. So for a particular location, if the number of crashes is exceptionally high, or exceptionally low, the odds are that they subsequently will tend back toward “normal,” or mean.

Often, locations are identified as having a safety issue at the peak of the curve of crashes plotted over time. What sometimes goes unrecognized is that this trend is not usually a straight line, with crashes increasing ad infinitum and the location continuing to become more and more dangerous over time until safety engineers intervene and apply the appropriate treatment. In reality, the location is on a rising line of a curve that will likely soon trend downward on its own. This fact does not mean that we cease trying to correct known safety deficiencies at locations. The caveat is that when the effects of the treatment are studied, the natural effects of regression to the mean must be recognized as contributing to the decrease in crashes along with the treatment itself. By failing to recognize this regression, safety engineers can overstate the benefits of a particular treatment.

Similarly, when deciding or planning to apply a tested treatment to other locations, the exact same treatment will have different effects at different locations. Because highway safety experiments do not occur in a laboratory, but on highways, even if one were able to choose the right methodology and determine a percent reduction in crashes at a

particular location, the same percent reduction could not be guaranteed by applying that treatment at other locations.

With before-and-after studies, several factors affecting locations over time can have an impact on crash experience at a location. These factors include traffic volume variations; driver behavior; weather; vehicle mix (percentage of trucks); and other countermeasures, treatments, or changes implemented at the location. In addition, changes to the way crashes are reported over time may affect before-and-after crash rates.

The third method is a mix of the two – a before-and-after with comparison sites. Here the after period is compared to the before period for the treatment sites and the comparison sites. Again, the comparison sites should be unaffected by the treatment. Comparison sites should be chosen for their physical similarities to the treatment sites and for their similar “before” period crash experience. If the before periods are relatively similar, it could be assumed that the after periods would be also, all things being equal. Because both populations would be equally susceptible to regression to the mean during the before-and-after periods, the effect essentially cancels out in the comparison. The differences in the crashes between the comparison and the treatment sites can more likely be attributed to the treatment than anything else.

It is important to note that crash statistics are merely a reflection or an indication of the total crashes at a location. First of all, not all crashes that occur are reportable according to the laws of minimum thresholds of property damage for crash reporting. Of those that meet the reporting threshold, not all are actually reported for a variety of reasons. Finally, of the crashes that are reported, documentation errors can cause some of the crash records to be attributed to an incorrect time or place. Because these circumstances exist everywhere, the crash histories of various locations are comparable to each other even though they may not be completely accurate.

Reviewers must be wary when making assumptions attributing the cause of declines in crashes. For instance, is a declining fatal crash rate in the United States the cause of better roads, better drivers, safer vehicles, or advances in lifesaving medical practices? Or could it simply be a change in the manner in which crashes are recorded as fatalities?

Finally, another method of analyzing crash statistics that is coming into favor is the Empirical Bayes method, which attempts to account for and correct the shortcomings of the other methodologies of crash analysis.

Ezra Hauer, author of several books and papers on highway safety analysis, defines safety as “the number of accidents (crashes) or accident consequences, by kind and severity, expected to occur in the entity during a specified period.” Since something expected can never be measured or quantified exactly, the validity of an estimation technique is gauged by its accuracy when tested against historical actual results.

The benefits of using the Empirical Bayes method are that the level of accuracy of estimated safety is better than other methods and it is able to account for regression to the mean. The Empirical Bayes method estimates expected safety at a given location using the crash history of that location and the expected crash frequency at other similar sites determined through an equation called the Safety Performance Function (SPF).

The SPF estimates the number of crashes at locations based on attributes of that location.

For this analysis of the improvement to the safety of the intersections in the Greensboro SafeLight program, the simple before-and-after study was chosen based on the data that was readily available and the fact that selection of treatment sites was not based solely on highest ranking by crashes.

2.2.3 PROGRAM SAFETY ANALYSIS

The crash data used for the before-and-after study of the red light photo enforcement program in Greensboro was prepared by the NCDOT from the Traffic Engineering Accident Analysis System (TEAAS). The installation dates of each of the cameras were provided by Peek Traffic through the Greensboro program manager. The before-and-after analysis includes a brief lag between the installation date and the beginning of the after period. The purpose of this lag time is to enable drivers to adjust to the new devices and signing in the field. To include the initial weeks after a new camera is installed would be to include non-typical crash data. It is standard practice to allow an adjustment period before the after period begins.

Because NCDOT prepared the crash analysis, the last available crash data from the Department of Motor Vehicles in TEAAS is through September 30, 2003. To create the longest study period possible, NCDOT analysts determined the length of the after period for each intersection to be the length of time between the end of the adjustment period and September 30, 2003. The before period mirrors the after period in length so that the before-and-after crash statistics can be compared. NCDOT's standard practice is to include all crashes within 150 feet of an intersection on all approaches as being at the intersection. The average daily traffic (ADT) for the median year was used to generate rates for all years so they can be compared to each other. **Table 5** lists the before-and-after periods used for the analysis.

Table 5. Crash Analysis Periods

Site Number	Intersection	Activation Date	Analysis Time Frame	Before Period	After Period
601	Holden Road & Spring Garden Street	2/2/2001	2 Years, 6 Months	08/01/98 - 01/31/01	04/01/01 - 09/30/03
602	Wendover Avenue & English Street	2/15/2001	2 Years, 6 Months	08/01/98 - 01/31/01	04/01/01 - 09/30/03
603	Battleground Avenue & Brassfield Road	3/12/2001	2 Years, 5 Months	10/01/98 - 02/28/01	05/01/01 - 09/30/03
604	High Point Road & Pincroft Road	5/9/2001	2 Years, 3 Months	02/01/99 - 04/30/01	07/01/01 - 09/30/03
605	Wendover Avenue & Church Street	5/4/2001	2 Years, 3 Months	02/01/99 - 04/30/01	07/01/01 - 09/30/03
606	Holden Road & Wendover Avenue	4/19/2001	2 Years, 4 Months	12/01/98 - 03/31/01	06/01/01 - 09/30/03
607	Randleman Road	4/20/2001	2 Years,	12/01/98 -	06/01/01 -

Site Number	Intersection	Activation Date	Analysis Time Frame	Before Period	After Period
	& Florida Street		4 Months	03/31/01	09/30/03
608	Randleman Road & Creek Ridge Road	4/26/2001	2 Years, 4 Months	12/01/98 - 03/31/01	06/01/01 - 09/30/03
609	Battleground Avenue & Pisgah Church Road	6/22/2001	2 Years, 2 Months	04/01/99 - 05/31/01	08/01/01 - 09/30/03
610	Holden Road & Pinecroft Road	5/31/2001	2 Years, 3 Months	02/01/99 - 04/30/01	07/01/01 - 09/30/03
611	High Point Road & Merritt Drive	5/24/2001	2 Years, 3 Months	02/01/99 - 04/30/01	07/01/01 - 09/30/03
612	Cone Boulevard & Church Street	7/3/2001	2 Years, 1 Month	06/01/99 - 06/30/01	09/01/01 - 09/30/03
613	Battleground Avenue & Cone Boulevard	7/25/2001	2 Years, 1 Month	06/01/99 - 06/30/01	09/01/01 - 09/30/03
614	Wendover Avenue & Big Tree Way	11/13/2001	1 Year, 9 Months	02/01/00 - 10/31/01	01/01/02 - 09/30/03
615	Freeman Mill Road & Coliseum Boulevard	9/18/2001	1 Year, 11 Months	10/01/99 - 08/31/01	11/01/01 - 09/30/03
616	Friendly Avenue & Spring Street	9/21/2001	1 Year, 11 Months	10/01/99 - 08/31/01	11/01/01 - 09/30/03
617	Wendover Avenue & Hill Street	8/17/2001	2 Years	08/01/99 - 07/31/01	10/01/01 - 09/30/03
618	Wendover Avenue & Bridford Parkway	8/10/2001	2 Years	08/01/99 - 07/31/01	10/01/01 - 09/30/03

A simple before-and-after study does not eliminate the effect of regression to the mean (i.e., the trending of crashes over time toward a mean, or average rate). If crash rates are on an upward trend, or at a historical high, the expectation is that the crash rate would begin to decrease over time, regardless of a treatment being implemented. This regression to the mean often causes reviewers to overstate the effectiveness of treatments because crash reductions can be attributed to this tendency in addition to the benefit of the treatment.

One way to account for the effects of regression to the mean is to find a set of comparison sites with similar characteristics, particularly similar before period crash histories, and then compare the after crash rates of the comparison sites to the after rates of the treatment sites. For this program review, a simple before-and-after study was conducted on the 18 SafeLight intersections.

While the 18 SafeLight intersections were in a top tier of signalized intersections in Greensboro in terms of safety concerns, they were not the 18 most hazardous locations. Of a list of 75 signalized intersections based on four previous years of high accident rankings by the City of Greensboro police department, City staff worked with Peek

Traffic to select the final 18. Because their selection was not based solely on highest ranking of crash history, as was the original list of 75, one could argue that regression to the mean may not have a strong effect on the after treatment crash results because these locations are not the locations expected to see the sharpest natural decline in crashes without a treatment.

In the before-and-after crash analysis, the measures of effectiveness (MOEs) examined include total crashes, angle crashes, rear end crashes, the equivalent property damage only number (EPDO), and the severity index. The reported angle crashes in the summary table include crashes coded as angle crashes, left turn different road, and left turn same road. Rear-end crashes include those coded as rear-end, slow or stop, and rear-end turn. The EPDO equation has coefficients that equate, in comprehensive costs, the fatal and injury crashes to property damage only (PDO) crashes. The equation used by NCDOT is as follows:

$$\text{EPDO} = 64(K+A) + 19.1(B+C) + \text{PDO}$$

Where K is the number of fatal crashes, A, B, and C are the number of crashes for each injury class, and PDO is the number of property damage only crashes. A, B and C classifications for injury classes correspond to the responding officer's interpretation of the severity of the injuries at the scene of the crash. The most severe of all of the injuries sustained by all persons involved is the injury class reported for the crash. The following injury classifications are defined by the National Safety Council in "ANSI D16.1-1996 Manual on Classification of Motor Vehicle Traffic Accidents, Sixth Edition".

A possible injury accident, which corresponds to injury class C on the North Carolina crash reports and in the above equation, is one where the victim is complaining of pain, limping, or has nausea or hysteria or other action but has no visible evidence of injury. A non incapacitating injury, which corresponds to injury class B, is one where the victim has a visible injury such as a lump, abrasion, cut or bruise, or other injury that is evident to observers at the scene of the accident. An incapacitating injury, corresponding to injury class A, is one where the person must be transported from the scene because injuries sustained in the accident prevent them from driving or walking from the scene. A fatal crash, noted by the letter K in the equation above, is one where the injury from the accident ultimately results in death.

The coefficients in the equation are derived by dividing the costs associated with the combination of fatal and class A crashes and the combination of B and C class crashes by the average costs associated with a property damage only crash. In other words, fatal and injury crashes cost society 64 times the amount that a property damage only crash does. Likewise, a crash involving a less severe injury costs more than 19 times a property damage only crash. It is evident that reducing either the number or severities of crashes has a positive impact on society.

For intersection 601, Holden Road at Spring Garden Street, in the before period there were eight class B injury crashes, 36 class C injury classes, and 48 PDO crashes for a total of 92 crashes. The EPDO is as follows:

$$\text{EPDO} = 64(0) + 19.1(8+36) + 48 = 417.6$$

The severity index is the EPDO divided by the total number of crashes. In this example, $417.6 / 92 = 4.54$. The severity index normalizes a location so that it can be compared to another location regardless of the total number of crashes at each location.

Table 6 and **Table 7** show the before-and-after MOEs for each of the 18 intersections, with the last row being the sum of all intersections. **Table 8** illustrates the percent change from before to after. A negative number, shown as shaded on the table, indicates a decline in crashes or crash rates from the before period to the after period.

Table 6. Before Period Crash Analysis Results

Site ID	Site Name	Before Total	Before Rate	Before Angle	Before Rearend	Before SI	Before EPDO
601	Holden & Spring Garden	92	136.80	42	39	4.54	417.60
602	Wendover & English	51	150.64	25	19	7.27	371.00
603	Battleground & Brassfield	34	110.45	19	9	4.26	145.00
604	High Point Rd. & Pinecroft	47	117.45	18	22	5.29	248.60
605	Wendover & Church	42	78.56	15	22	5.23	219.60
606	Holden & Wendover	55	170.33	9	30	4.90	269.60
607	Randleman & Florida	27	99.97	14	7	9.56	258.20
608	Randleman & Creek Ridge	53	184.59	24	17	3.65	193.60
609	Battleground & Pisgah Church	38	106.86	10	23	3.34	126.80
610	Holden & Pinecroft	5	23.27	2	2	2.48	12.40
611	High Point Rd. & Merritt	59	154.40	26	24	4.01	236.60
612	Church & Cone	27	91.44	9	13	4.56	123.20
613	Battleground & Cone	30	75.09	10	18	4.95	148.40
614	Wendover & Big Tree	57	129.09	22	30	3.86	219.80
615	Freeman Mill & Coliseum	32	97.96	17	10	6.84	218.80
616	Spring & Friendly	29	126.90	20	4	5.08	147.40
617	Wendover & Hill	46	87.89	5	38	4.54	208.80
618	Wendover & Bridford	52	121.81	22	20	5.02	261.00
TOTAL		776		309	347	4.93	3826.40

Table 7. After Period Crash Analysis Results

Site ID	Site Name	After Total	After Rate	After Angle	After Rearend	After SI	After EPDO
601	Holden & Spring Garden	69	96.77	27	30	5.42	374.20
602	Wendover & English	53	147.34	20	24	6.06	321.20
603	Battleground & Brassfield	37	112.95	16	16	5.85	216.40
604	High Point Rd. & Pinecroft	55	129.42	23	27	4.50	247.40
605	Wendover & Church	65	114.11	23	36	5.24	340.60
606	Holden & Wendover	44	128.15	9	23	5.92	260.40
607	Randleman & Florida	24	83.84	12	8	5.62	135.00
608	Randleman & Creek Ridge	42	137.70	17	19	4.52	190.00
609	Battleground & Pisgah Church	24	63.61	3	16	2.23	53.60
610	Holden & Pinecroft	9	39.38	4	4	10.24	92.20
611	High Point Rd. & Merritt	39	101.81	17	16	5.17	201.80
612	Church & Cone	28	89.42	12	12	4.17	116.80
613	Battleground & Cone	41	96.85	14	23	3.89	159.40
614	Wendover & Big Tree	51	108.91	15	29	2.89	147.20
615	Freeman Mill & Coliseum	19	55.02	8	7	3.73	70.80
616	Spring & Friendly	22	90.96	17	1	10.58	232.80
617	Wendover & Hill	68	122.57	2	62	4.48	304.80
618	Wendover & Bridford	55	121.52	26	23	5.17	284.40
TOTAL		745		265	376	5.03	3749.00

Table 8. Percent Differences from Before to After Periods

Site ID	Site Name	Total	Rate	Angle	Rearend	SI	EPDO
601	Holden & Spring Garden	-25%	-29%	-36%	-23%	19%	-10%
602	Wendover & English	4%	-2%	-20%	26%	-17%	-13%
603	Battleground & Brassfield	9%	2%	-16%	78%	37%	49%
604	High Point Rd. & Pinecroft	17%	10%	28%	23%	-15%	0%
605	Wendover & Church	55%	45%	53%	64%	0%	55%
606	Holden & Wendover	-20%	-25%	0%	-23%	21%	-3%
607	Randleman & Florida	-11%	-16%	-14%	14%	-41%	-48%
608	Randleman & Creek Ridge	-21%	-25%	-29%	12%	24%	-2%
609	Battleground & Pisgah Church	-37%	-40%	-70%	-30%	-33%	-58%
610	Holden & Pinecroft	80%	69%	100%	100%	313%	644%
611	High Point Rd. & Merritt	-34%	-34%	-35%	-33%	29%	-15%
612	Church & Cone	4%	-2%	33%	-8%	-9%	-5%
613	Battleground & Cone	37%	29%	40%	28%	-21%	7%
614	Wendover & Big Tree	-11%	-16%	-32%	-3%	-25%	-33%
615	Freeman Mill & Coliseum	-41%	-44%	-53%	-30%	-45%	-68%
616	Spring & Friendly	-24%	-28%	-15%	-75%	108%	58%
617	Wendover & Hill	48%	39%	-60%	63%	-1%	46%
618	Wendover & Bridford	6%	0%	18%	15%	3%	9%
TOTAL		-4%		-14%	8%	2%	-2%

2.2.4 RESULTS

The results of this crash analysis and most before-and-after study results, as Ezra Hauer notes in his book—*Observational Before-After Studies in Road Safety, Estimating the Effect of Highway and Traffic Engineering Measures on Road Safety*—are likely affected by many factors, not just the single cause being studied. Here, the changes in safety as measured by number of crashes may be the effect of traffic volumes, weather, planned and unplanned special events, driver behavior, and other applied countermeasures.

Fifteen of the 18 intersections saw reductions, or improvements, in at least one MOE from before to after. While the statistical significance of such results may be debated due to the small number of locations and the small number of crashes at each intersection, the total number of crashes at all 18 intersections went down by 4% with a standard deviation of 0.049 from 776 to 745, and the number of angle crashes—usually the more severe crash type—went down by 14% with a standard deviation of 0.071 from 309 to 265.

By analyzing each of the intersections individually, it is apparent that some locations experienced more improvements than others. This fact is to be expected since the highest accident locations were not always chosen for the red light photo enforcement program. There is a potential for the intersections with the highest number of angle crashes to benefit from these cameras as well. The City of Greensboro may receive added benefits by changing or adding signalized intersections to the program in the future with a history of angle crashes and with characteristics of intersections that saw great reductions in crashes during the SafeLight program.

Suggested future research is to choose comparison sites in another jurisdiction – most likely Durham, North Carolina – to further evaluate the impact of the cameras on the safety of the intersections by attempting to account for regression to the mean. Durham is far enough away from Greensboro that the public campaign and posted signs at the

SafeLight intersections would not affect the drivers in Durham; yet is close enough to share weather events and growth trends that affect traffic volumes.

2.3 INVENTORY AND OBSERVATIONS OF EXISTING CONDITIONS

As part of this project, field inventories were conducted at all 18 intersections. Photos were taken and sketches and observations were recorded, including speed limits, approximate approach grades, significant signage, presence of street lighting, pedestrian accommodations, sight distance, and other relevant observations.

Additional information about each project intersection was gathered after the field inventory. Greensboro personnel provided electronic copies of each signal plan. Average Annual Daily Traffic (ADT) volumes for the intersections, which include traffic on all approaches, were obtained from the City website. Yellow and all-red clearance times were obtained from the Greensboro Department of Transportation signal system manager. In addition, Peek Traffic provided records indicating when the cameras had undergone maintenance. The camera maintenance logs are contained in the project database.

Photos of each project intersection and the field data collection sheets are included in **Appendix G** and **Appendix H**. **Table 9** summarizes the existing characteristics of each intersection in Greensboro's red light photo enforcement program.

In general, the authors have not observed frequent or blatant violations of red light running in the City. If the numbers of red light runners before inception of the program were mainly inattentive drivers, the presence of each individual red light camera may not change the behavior of those drivers because they are only as likely to notice the red light cameras and warning signs as they are to notice the traffic signal and advance warning signs. The 18 chosen intersections appeared to be well distributed across the city covering various socioeconomic areas but the locations are limited mainly to three main facilities in Greensboro.

Several of the camera monitored approaches do not have left turn lanes or have restrictions on the ability to make left turns. One could hypothesize that this lane configuration is confusing to drivers causing them to be distracted and make driving errors such as running a red light, but there are no facts currently to support this idea.

Table 9. Intersection Characteristics

Site No.	Intersection	Phases	ADT (Year) ¹	Monitored Approach	Monitored Phase	Speed Limit (mph)	Thru Lanes	Grade ²	Yellow Time (sec)	All-Red Time (sec)
601	Holden Road & Spring Garden Street	6	75,791 (2001)	Southbound	6	35	3	1%	4.0	1.8
602	Wendover Avenue & English Street	6	40,582 (2003)	Westbound	2	45	3	1%	4.7	1.0
603	Battleground Avenue & Brassfield Road	6	38,235 (2003)	Northbound	2	45	2	0%	4.7	1.2
604	High Point Road & Pinecroft Road	4	45,969 (1998)	Eastbound	2	35	3	-1%	4.0	2.3
605	Wendover Avenue & Church Street	3	71,392 (2003)	Westbound	2	45	3	-2%	4.7	1.2
606	Holden Road & Wendover Avenue	6	41,577 (2003)	Northbound	2	35	2	0%	4.0	1.9
607	Randleman Road & Florida Street	5	30,759 (1999)	Northbound	2	35	2	1%	4.1	1.4
608	Randleman Road & Creek Ridge Road	4	36,957 (2003)	Northbound	2	35	2	0%	4.0	1.8
609	Battleground Avenue & Pisgah Church Road	6	46,313 (2001)	Southbound	2	35	2	-1%	4.2	1.5
610	Holden Road & Pinecroft Road	4	26,198 (2002)	Southbound	2	45	2	2%	4.7	2.0
611	High Point Road & Merritt Drive	6	46,644 (2002)	Eastbound	6	35	3	-1%	4.0	1.4
612	Cone Boulevard & Church Street	8	38,750 (2000)	Westbound	2	35	2	0%	4.0	1.9
613	Battleground Avenue & Cone	6	62,445 (2003)	Northbound	6	35	3	0%	4.0	2.0

Site No.	Intersection	Phases	ADT (Year) ¹	Monitored Approach	Monitored Phase	Speed Limit (mph)	Thru Lanes	Grade ²	Yellow Time (sec)	All-Red Time (sec)
	Boulevard									
614	Wendover Avenue & Big Tree Way	6	71,219 (2001)	Westbound	6	45	4	-4%	5.0	1.3
615	Freeman Mill Road & Coliseum Boulevard	6	45,171 (1999)	Northbound	6	45	2	0%	5.0	2.0
616	Friendly Avenue & Spring Street	2	23,597 (2003)	Southbound	2	20	3	1%	4.0	1.3
617	Wendover Avenue & Hill Street	3	71,738 (2003)	Eastbound	2	45	3	-3%	4.7	1.2
618	Wendover Avenue & Bridford Parkway	8	61,628 (2003)	Westbound	6	45	3	-2%	5.0	1.7

1. Average Daily Traffic (ADT) values obtained from the Greensboro Department of Transportation website <http://www.ci.greensboro.nc.us/gdot/business/safelight/>
2. Grades obtained from traffic signal plans and field observations

2.4 LITERATURE REVIEW

As part of this program review, other studies published on Greensboro's and other's red light photo enforcement programs were reviewed. In addition, books and papers written about traffic engineering evaluations on safety were reviewed to determine the most appropriate methods to evaluate the impacts of the red light photo enforcement program in Greensboro on public safety.

2.4.1 NC A&T STUDY

In January 2004, Dr. Mark L. Burkey forwarded a copy of a report to the City that he published in September 2003 with Dr. Kofi Obeng on behalf of the Urban Transit Institute at North Carolina Agricultural and Technical State University (NC A&T) entitled, "A Detailed Investigation of Crash Risk Reduction Resulting from Red Light Cameras in Small Urban Areas". The Greensboro SafeLight program is the focus of the study. The following is a summary of the methodology and findings contained in that report as well as comments regarding the researchers' approach.

The authors of the report state in the executive summary that their research stemmed from claims asserted in other studies about the effectiveness of red light photo enforcement programs that they felt was based on insufficient accident data or based on too few locations. The NC A&T researchers developed negative binomial time-series regression models to relate signalized intersection characteristics to crash types and severities. The data used in their analysis was obtained from the City Traffic Engineering Department and from NCDOT the data was not verified by the safety engineers at NCDOT for accuracy or completeness.

In the project approach section of the report, the investigators reported that yellow clearance intervals were too low at several intersections. NCDOT published revised yellow clearance interval guidelines in the summer of 2002. According to the City, 4 of the 18 SafeLight intersections had yellow times that were 0.1 to 0.2 seconds below the new standards and were promptly corrected. The yellow times complied with the previous NCDOT standards and did not compromise the safety of the intersections.

The title of the study refers to "small urban areas". In 2000, the population of Greensboro was 223,891. Nationally Greensboro's population is much smaller than other metropolitan areas but in North Carolina, Greensboro the third largest municipality in the state behind Charlotte and Raleigh.

The NC A&T report addresses different classifications of crash severity and the subjectivity of reporting by the responding officer. A table in the report illustrates that the 2001 comprehensive costs used by NCDOT are higher than the comprehensive costs published by the Federal Highway Administration when expressed in 2002 dollars. The study also notes that the true number of crashes at an intersection cannot be known because all crashes are not reported. Those with an estimated value less than \$1,000 are not considered reportable. Because no crashes with damage valued below \$1,000 are reported anywhere, the number of crashes between locations are still comparable. On a pure crash number basis, though, the authors note that the reporting threshold may cause certain types of crashes with low costs to be chronically underreported.

On the discussion of red light running, the authors raised points concerning unintentional red light running and dilemma zones. According to the authors, if a stop line is located in front of a curb line, a driver who stops at the line on red has entered the intersection and has essentially “run” the red light. By the definition of the intersection contained in the Uniform Vehicle Code (UVC) and the Manual on Uniform Traffic Control Devices (MUTCD), a stop line would not be located within an intersection because this is the area at two cross streets where vehicles traveling in the street may come in contact with each other. If a curb line is set away from the travel lanes, it is not used as an intersection boundary and therefore a vehicle stopped at a stop line in front of a curb line is still not within the accepted bounds of the intersection. Committees are currently working to reword the definition in the UVC and the MUTCD to clearly state that it is the area within the stop lines or crosswalks.

The authors assert that “at some intersections, it has been found that so-called ‘dilemma zones’ exist” but do not state for which intersections they are making that claim. A dilemma zone is the length of roadway where a driver given a yellow indication cannot safely stop or go through the intersection before the light turns red. If the driver had been a bit farther away, stopping would have been the obvious choice; closer, the driver would have known proceed past the stop line on yellow.

NCDOT and the City use clearance calculations to determine yellow and all-red times that attempt to eliminate the dilemma zone. The calculation determines the exact time it would take a vehicle, traveling at the posted speed, to comfortably stop at the stop line or to clear the intersection traveling at the posted speed. This clearance time corresponds to a distance from the stop line on the approach. The calculation assumes a 1.0 second perception reaction time, a vehicle length of 20 feet and a deceleration rate of 10 feet per second squared. All of the SafeLight intersections in Greensboro have sufficient clearance times according to the NCDOT equation and guidelines for attentive drivers traveling at the posted speed limit to be able to stop or safely clear the intersection when faced with a yellow indication.

The closer a vehicle is to the exact point at which it makes more sense to go than to stop, the less sure he is as to which is the right choice. This can be referred to as the decision zone. The goal of signal design and signal timing is to minimize the numbers of drivers who are presented with a yellow when they are in the decision zone.

The evaluators collected data on signalized intersections in Greensboro, but omitted the intersections at highway exit ramps. The report did not state why they determined these particular traffic signals to have different characteristics than all other traffic signals.

The crash data used in the study was obtained from the NCDOT crash database, referred to as the Traffic Engineering Accident Analysis System (TEAAS). The NCDOT data is collected in a more robust database compared to City data. The time period used for the crash analysis of all intersections, including the SafeLight intersections, was from 1/01/99 to 9/30/02. As of September 30, 2002, some of the cameras had only been active for a year. The simple before-and-after study showed little change to the monthly rates of crashes per million entering vehicles. The after period was much shorter than the before period, which may have skewed the resulting numbers. In addition, the after period encompassed the adjustment period for each camera where construction and fine

tuning would have been taking place, as well as drivers becoming accustomed to the new roadside device. The numbers of crashes used and the average daily traffic (ADT) were not included in the study, therefore the results cannot be verified.

The researchers used a negative binomial regression model to evaluate the impact of red light cameras on crashes at intersections, which was determined to be a better model for intersection characteristics than the Poisson regression model. An explanation of their methodology could be expanded to help the reader follow this decision. For these models, each trait or variable selected should be independent and have no correlation to the others, which is debatable for this study.

Interestingly, the evaluators indicated that the presence of a “no left turn” sign had a positive coefficient in the model, indicating an increasing effect on the number of crashes. The presence of red light cameras also had a non-negative coefficient in the model. Again, it is not clear how these coefficients were derived or the extent of correlation between variables, which are presumed to be independent variables. Results of coefficients for various variables on total crashes at 302 intersections in Greensboro as well as various crash types were reported. The model attempts to take into account the crashes at the red light camera locations versus other signalized intersections in Greensboro, but fails to acknowledge the impact the photo enforcement program may have had on the other locations.

Addressing accident severity, the NC A&T study reports Poisson model results for severe crashes, crashes resulting in possible injury and crashes resulting in property damage. Presence of a red light camera had a positive coefficient for each of these crash types.

In the summary of findings section Burkey and Obeng state that “various road signs and road characteristics are associated positively with types and severity of accidents at signalized intersections.” It is unclear how the authors have associated the presence of the signs with the numbers or severity of crashes. The same is true for the presence of red light cameras.

Burkey and Obeng conclude that increases in traffic volumes lead to increases in accidents. They also conclude that locations with longer yellow times have fewer angle crashes and more rear end crashes. Because the change in yellow times was not measured, it is difficult to conclusively state that the yellow times accounted for the crash rates. The authors also did not define “longer” yellow times so the reader is unsure about its meaning. A longer yellow time could be defined as being longer than other intersections’ yellow times, but appropriate for the intersection, or actually longer than the minimum for that particular intersection.

The results seem to be a product of the chosen data set, because other studies show that crashes have decreased at Greensboro SafeLight intersections over different time periods. Whether crashes have decreased at a rate more or less than expected is yet to be studied. The NC A&T study, however, indicates that crashes at red light camera intersections increased while crashes at other signalized intersections in Greensboro decreased over the same time period.

In general, the report is heavy on conclusions and light on data. The SafeLight intersections were not looked at individually to determine if red light cameras are

effective at some locations but not others. It is also unclear how the results presented in this report can be applied to other programs.

2.4.2 NCHRP SYNTHESIS

The National Cooperative Highway Research Program (NCHRP) recently published Synthesis 310, “Impact of Red Light Camera Enforcement on Crash Experience.” As with other synthesis reports, this is a compilation of previous reports – no new research was performed aside from a survey sent to 50 US municipalities with red light photo enforcement programs. This synthesis, in addition to investigating crash rates and severities at intersections monitored by red light cameras, specifically aimed to identify factors of the red light camera intersections or programs that could be attributed with changes in safety. Also, the synthesis noted the methodologies by which the safety analyses were performed. The report is an excellent compilation and summary of red light photo enforcement programs and studies.

The synthesis was undertaken because red light running has become a national safety issue with 260,000 red light running crashes resulting in 850 deaths and 1.4 million injuries annually. The study acknowledges that while the camera operation is similar from city to city, there are varying factors from site to site and program to program that will cause the effectiveness of the cameras and the programs to vary.

Included in the synthesis were summaries of international studies of red light cameras in Australia, Great Britain, and Singapore, as well as domestic studies in Oxnard, CA; Polk County, FL; Mesa, AZ; San Diego, CA; and San Francisco, CA. Lastly, results of a meta-analysis of programs in Howard County, MD and Charlotte, NC are included which show a 26% reduction in rear end and angle crashes for those two programs.

A second part of the NCHRP synthesis was a survey sent to 50 municipalities in the United States with red light photo enforcement programs; of which 26 of the 50 municipalities responded to the survey. Crash statistics are provided in the synthesis for Baltimore County, MD; Charlotte, NC; Howard County, MD; and others. All programs reporting crash statistics saw a decrease in crashes, but the true effectiveness of the cameras cannot be reported without accounting for other factors including traffic volumes and regression-to-the-mean.

The synthesis includes constructive comments from the returned surveys and a discussion of the procedures to evaluate the safety of red light photo enforcement programs. The report states that because photo enforcement programs are considered controversial in the United States, studies with positive, justifiable results are important to the continuation and expansion of these programs.

The synthesis notes that two types of evaluations have occurred – one where a municipality attempts to determine the effectiveness of its cameras on its jurisdiction, and the second where a reviewer attempts to define the effect that red light cameras have on the number of crashes at signalized intersections in general. The second has a much broader scope than the first and requires more data and a more complex evaluation.

The synthesis lists red light violations, conflicts or near-collisions, and crashes as accepted measures of effectiveness (MOE). A selected MOE for a study is dependent on

available data. The evaluation methodologies discussed in the synthesis focus on crashes as the MOE.

In an ideal before-and-after study, each of the crash reports would be reviewed directly for accuracy, a significantly long after period would exist, and the study could be updated annually. In addition, sufficient data would be available to examine crashes by approach, type, severity, and violation charged.

Designs for an effective study include simple before-and-after, before-and-after with central group, before-and-after with comparison group, cross sectional, and trend analysis. Each study type has benefits and drawbacks. To determine the effectiveness of a red light camera, the results of the study can be compared or statistically analyzed using several accepted methods including Empirical Bayes, Chi-squared, Poisson Regression, paired t-test, or z-test.

Some issues to weigh when reporting the results of a study are the impacts of clearance interval times, varying traffic volumes, spillover or halo effects, and other applied engineering countermeasures.

The synthesis was not able to determine factors that impact crashes at red light camera intersections from available studies. Available research presented in the synthesis has shown that reductions in crashes have been seen following the installation of red light cameras, but the results are sometimes statistically insignificant due to small sample size and flaws in the analysis, such as failing to account for regression-to-the-mean.

Overall, the synthesis report found that photo enforcement can be an effective tool to counteract red light running and associated crashes. More systems must be deployed and more time must pass with the existing systems before the benefits can be definitively quantified.

2.5 OBJECTIVE 1 FINDINGS AND RECOMMENDATIONS

Based on the results of the crash analysis, the SafeLight program appears to have met the City's first objective of enhancing safety. Total crashes have decreased 4% and angle crashes have decreased 14% in the after period of the study. Further analysis including comparison sites could yield a clearer picture.

With a decrease of 17% in average annual monthly citations from 2001 to 2004, the citation history also indicates that the objective of enhancing safety is being met.

The main concern from the traffic engineering and safety field study is that some locations may have seen problems with red light running due to factors that cannot be overcome with the red light cameras. In particular, locations with a high percentage of unfamiliar drivers, such as around the coliseum and along the restaurant area on Wendover Avenue at I-40, may not see improvements in driver behavior due to the cameras.

Unfamiliar drivers may be inattentive due to unfamiliarity with the area, which the cameras alone cannot remedy. Likewise, unfamiliar drivers had not been exposed to the companion public service campaign in the community. Geometry that causes poor

visibility of the traffic signal is not being overcome with the presence of a red light camera. The additional signing for the camera may help to alert motorists to the upcoming traffic signal. Also, the presence of a photo enforcement program in the community may heighten driver's attention to traffic signals in the area.

Providing a strong media and public service campaign promoting safe driving practices in conjunction with a photo enforcement program may urge drivers to be more attentive when driving. Likewise, word of mouth about the cameras and the \$50 citations may cause drivers to be more cautious. For this reason, it is good to install cameras on main corridors and distributed across communities in the city. The program may be better served by further dispersing the locations based on need.

Recommendations to improve the ability of the SafeLight program to enhance safety include:

- Performing a more detailed crash evaluation using comparison sites or the Empirical Bayes method.
- Selecting SafeLight locations where cameras are more likely to impact driver behavior than other measures.
- Addressing geometric concerns at some locations.

3 OBJECTIVE 2 – PROVIDE ADDITIONAL ENFORCEMENT

The second objective of Greensboro's SafeLight program is to provide photo enforcement as an additional method of violation enforcement. The benefit to Greensboro Police Department (GPD) traffic enforcement officers would be that they could use their limited resources elsewhere to make the City safer.

3.1 GREENSBORO POLICE DEPARTMENT RESOURCES

Between 1998 and 2004, the GPD underwent several reorganizations and leadership changes. For this reason, it is difficult to definitively quantify the effects of the photo enforcement program on GPD's typical operations over time because their standard practices have not been uniform over time.

GPD currently has eleven traffic enforcement officers. Four of those officers are assigned to patrol the highways, while the remaining seven officers patrol city streets for moving violations. In the past 5 years, the number of officers has remained essentially the same through decentralizing and recentralizing the traffic enforcement officers unit. During those shifts their focuses and priorities have changed, but their essential tasks have remained the same, that is, enforcement of the motor vehicle code and investigating accidents.

3.2 GREENSBORO POLICE DEPARTMENT CITATIONS

Because the citations issued for red light running from the photo enforcement program are civil citations and not moving violations or classified as infractions to the motor vehicle code, the GPD is not actively involved with the program. The GPD exercises no authority over civil citations issued for red light running. To prevent double jeopardy for violators and to allow the GPD to benefit from the presence of photo enforcement, traffic enforcement officers as a practice do not monitor photo enforced intersection approaches for red light running violations. This allows these officers to focus more time on monitoring the other approaches at these intersections or at other intersections and monitoring for other types of violations.

GPD noted that the 18 red light running cameras in Greensboro provide a complementary enforcement resource by aiding the officers in monitoring approaches at intersections and enforcing traffic laws. GPD likes the fact that the cameras are able to clearly record motorists who are breaking the law. In some cases, the police have used the camera images to identify hit and run vehicles.

The City and GPD maintain a list of the 40 highest crash intersections in the city. This list is updated quarterly based on crash history. GPD reviews the crash history and identifies types of motor vehicle code infractions that may be contributing to the crashes at each location that they can target for enforcement to try to reduce the number of crashes. Traffic enforcement officers are committed to spending a portion of each of their shifts at one of more of the intersections on this high crash list. If one or more of the 18 SafeLight intersections appear on the list, the officers do not spend time

monitoring the photo enforced approach for red light running violations and can instead allocate their time and resources to the other intersections.

If an officer takes 10 minutes to issue a citation, as reported by the GPD, the 89,000 citations issued by the SafeLight Program since inception would have taken nearly 15,000 hours of officers' time. This would equate to 2-3 additional officers doing nothing but issuing red light running citations full time for 3 years. At a reported cost of \$21.13 per hour for a law enforcement officer's salary and benefits, it would have cost the city over \$300,000 to have officers issue the same number of citations. As a side note, had the citations been issued by a law enforcement officer rather than through the SafeLight program, they would have carried points and a fine and court costs of \$125, which also would have resulted in additional costs to the citizens of Greensboro.

In 2000, the year before the red light cameras were installed in Greensboro, GPD issued 1,446 red light running citations between January 1 and December 31. In 2003, the most recent calendar year in which all 18 cameras were operational, GPD issued 1,043 red light running citations. This is a reduction of 403 citations or a 28% decrease in citations issued from 2000 to 2003. While this reduction in citations is significant, it is not possible to state definitively the degree of impact the photo enforcement program had on this statistic.

3.3 OBJECTIVE 2 FINDINGS AND RECOMMENDATIONS

The SafeLight program in Greensboro has met the objective of providing additional enforcement of red light running violations. Both the City and GPD agree that the red light cameras have provided additional enforcement during the time they have been in operation. The GPD traffic enforcement officers use the presence of the cameras for full red light enforcement at the 18 approaches to intersections allowing them to use their resources toward other objectives and other locations while on duty patrolling the City. GPD also uses the camera images to identify hit and run vehicles and feels that the program has raised community awareness of the issue of red light running.

Involving GPD in decisions concerning the placement of cameras could yield greater benefits from the cameras. Previous year's high crash location lists were used in the initial selection of candidate intersections but GPD involvement ceased after the initial selection. GPD suggests that the City consider adding new locations and taking over full operation of the system from the contractor.

4 OBJECTIVE 3 – RAISE AWARENESS

The third objective of Greensboro's SafeLight program is to raise awareness of safe driving practices in Greensboro. To evaluate the degree to which the program is meeting this objective, it is necessary to investigate the methods employed by the City to educate the public and how the program has been perceived in the media and surveys.

4.1 PROGRAM OUTREACH

Before the first camera was installed, the City of Greensboro had begun a planned outreach campaign to educate the citizens about the SafeLight program. The campaign focused on reaching the public both through the media and through direct contact.

The City issued press releases that introduced the SafeLight program and then issued a press release when each red light camera was activated. Many local media outlets picked up on the press releases and reported on the SafeLight program status. In addition, the City used its own community access Channel 13 to reach the public. In cooperation with the SafeLight Charlotte program, a fifteen minute video was produced that explained the SafeLight program and its operations. In 2002, as the cameras were being installed, this video was shown eight times a day on Channel 13 over the course of six months.

The City also went directly to the citizens to educate them on the SafeLight program. A flyer (shown in **Appendix C**) explaining the program was distributed with water bills mailed to citizens in 2002. This reached approximately 90,000 citizens in Greensboro. In addition, the program provided about 5,000 SafeLight brochures (shown in **Appendix D**), 10,000 SafeLight bumper stickers, and 10,000 children's flashing Safelight buttons for distribution to Greensboro citizens. Finally, City staff attended approximately 25 civic group meetings and City Hall in the Mall events to present the SafeLight program to the public.

4.2 MEDIA REVIEW

Appendix J includes summaries of articles collected concerning red light cameras in Greensboro, the Triad Region, North Carolina, and other states that provide an indication of the attitudes toward red light photo enforcement programs. For the reasons mentioned in the legal review (**Section 5**), there are citizens, elected officials, and government workers on both sides of this issue.

Individual citizens and some elected officials have taken issue with red light photo enforcement programs across the country and the media has aired or printed their viewpoints in several instances. A primary theme throughout several articles is the perception that government agencies are providing a mechanism for private companies to profit at the expense of its citizens and that the point of the programs is to generate revenue rather than to improve safety. Some imply that system operators have chosen locations and adjusted clearance times to maximize revenue.

The right to due process, violation of privacy, the presumption of guilt, and the fining of vehicle owners without proof of driver identification are other themes seen in news

articles critical of photo enforcement programs. Municipalities have been referred to as “big brother” who is watching over all with the cameras.

Articles portraying the benefits of red light camera programs report the reduction in crashes and decreases in citations issued during the programs. Articles also report what other safety improvements have benefited the community with revenues from the paid citations. While articles have been published reporting the benefits of programs, few point out that the vast majority of those who are photographed and fined are guilty of an action that jeopardizes the safety of others. Many, if not all, systems have been portrayed positively and negatively by the media at one time or another. In the Triad region, many news reports have centered on the issues raised by the High Point lawsuit.

As this report shows, there are not enough systems or evaluations of systems to definitively state all the benefits of a system. Until those evaluations are completed, and perhaps after, there will be questions by the media about red light photo enforcement systems. Because it is a new and different type of traffic safety initiative in this country, it is not surprising that there are both supporters and detractors. When first introduced, even seat belt laws were not well received by everyone.

A complete copy of each article summarized for this media review is included in **Appendix K**.

4.3 PUBLIC OPINION SURVEY

In 2001, MarketWise, Inc. conducted a statewide survey of cities in North Carolina. This consisted of telephone interviews with residents in Greensboro, High Point, Charlotte, Fayetteville, Wilmington, Asheville, and Raleigh. At the time, some of the cities had active SafeLight programs and some did not. The survey results show that statewide:

- 62% of residents believe that traffic violations are a problem.
- 57% of residents believe that running red lights is a problem.
- 98% of residents are aware of operational SafeLight programs.
- 82% of residents believe SafeLight is beneficial to the community.
- 74% of residents support the SafeLight program.
- 33% of residents agree that the SafeLight program has changed their driving behavior.

In addition, the survey found that residents learn of the SafeLight program most often from television news stories, newspaper articles, and intersection warning signs.

A citizen research survey conducted in May 2003 by AH HA! polled 750 residents from across all five districts in Greensboro. Citizens responded that red light running was their third highest traffic safety concern behind aggressive drivers and speeding. Approximately 60% of the citizens surveyed support the red light camera program and feel that it is effective.

4.4 OBJECTIVE 3 FINDINGS AND RECOMMENDATIONS

The City of Greensboro has undertaken a planned public awareness campaign. Survey results show that citizens are definitely aware of SafeLight and most are supportive of the

program and view it as being beneficial to the community. However, it appears that the program is not causing citizens to change their driving behavior to the same degree as programs in other cities. The survey findings and the results from the citation analysis in **Section 2.1** support this claim. While the number of red light running citations issued by SafeLight has decreased, it is possible that the program outreach could be increased to make a larger impact on driver behavior.

Some additional methods used by other red light photo enforcement programs to promote the program and educate drivers include:

- Regular spots on local television networks.
- Distribution of flyers and brochures to schools and driver education classes to target teenage drivers.
- Program annual reports.
- Advertisement on billboards.

Annual reports are currently being developed by Wilmington and Charlotte successfully. The important aspects of the annual report should provide citation and crash information as well as basic information on the program and its operations. However, the report should also provide information on revenue and highlight how the money was spent and how it has benefited the public. Also, the report should provide information on customer service and address specific complaints that were received and any changes that have resulted from feedback. This would have been the place for the City to publicize that the due date for citations was increased from 21 to 28 days. Ideally, the annual reports would also be kept on a regularly updated SafeLight webpage maintained by the City.

To date, the media reaction to the SafeLight program has not been overly positive, focusing on revenue issues, claims of increased crashes, and lawsuits. The positive aspects of the program, including how the revenue is being spent on additional safety actions, have not been reported to the extent that the High Point lawsuit has been reported. The City should continue to work with local media outlets and cultivate a relationship where the positive aspects of this and other safety programs will be touted by the media. Although shifting perceptions in media markets is difficult, it should be a priority and focus of the City's further program outreach.

5 LEGAL REVIEW

The legal review conducted for this report examines the current laws, state statutes and local ordinances governing red light running and photo enforcement and how the Greensboro program complies with these laws. The recent lawsuit filed in High Point against the photo enforcement system there was researched and discussed as well as the overarching legal issues for red light camera programs across the nation.

5.1 *RED LIGHT RUNNING REGULATIONS*

The North Carolina General Statutes specifically prohibit red light running in all locations at signalized intersections. Section 20-158 (part of the Motor Vehicle Act of 1937) states that “vehicles facing a red light controlling traffic passing straight through an intersection from a steady or strobe beam stoplight shall not enter the intersection while the steady or strobe beam stoplight is emitting a red light controlling traffic passing straight through an intersection.”

The Motor Vehicle Act also specifies the penalty for red light running. According to Section 20-176 (Penalty for Misdemeanor or Infraction), violations of the red light running provision are defined as infractions. In addition, persons found responsible for infractions may incur a penalty not to exceed \$100. The Judges Council sets and publishes annually the fines for infractions. Currently, the violation fine is \$25 with an additional mandatory court cost of \$100.

Finally, the North Carolina Department of Motor Vehicles has the authority to assign three points to an individual’s driving record for convictions related to the offense of running a red light. Insurance points may also be assessed for a red light running conviction; generally one point is assigned in North Carolina for this violation.

5.2 *PHOTO ENFORCEMENT REGULATIONS*

For contractors to operate photo enforcement systems and issue citations, the red light running that occurs at monitored intersections has been classified as a civil violation rather than an infraction of the motor vehicle code.

The legal basis for the Greensboro Red Light program is found in the North Carolina General Statutes and the City of Greensboro Code of Ordinances. The applicable portion of the NC Statutes is Chapter 160A-300.1. It can be viewed in its entirety in **Appendix E**.

The statute is titled “Use of traffic control photographic systems” and defines a photographic system that is used to record vehicles violating a traffic control ordinance. The major points of the statute include:

- Any photographic system must meet local and North Carolina Department of Transportation (NCDOT) requirements and standards.
- Any photographic system must be identified by advance warning signs posted no more than 300 feet from the location.
- Municipalities may adopt ordinances for civil enforcement and fine collection with the following restrictions:

- The vehicle owner is responsible for the violation unless they can produce the name and address of the driver or prove that the vehicle was being used without permission.
- The violation is a civil penalty of \$50 and no points will be assigned to the owner's driving record or insurance. If a citation is not paid, the person may be assessed a late penalty not to exceed \$100.
- The citation shall clearly state the appeals process and the municipality should have non-judicial administrative hearing to review citations.

The prevailing City of Greensboro ordinance is Section 16-58. This ordinance, titled "Traffic control photographic systems," can be viewed in **Appendix F**.

This City ordinance defines a red light running violation as a vehicle crossing the stop line at an intersection approach while the traffic signal is emitting a steady red light. Any citation issued from a photographic system is issued to the vehicle owner, and the fine assessed is a civil penalty of \$50. If the penalty is not paid within 21 days after the notification, then the vehicle owner loses the right to contest the citation and a late penalty of \$50 is added to the fine. Finally, the ordinance states that the City of Greensboro Department of Transportation will administer the red light program and will establish an administrative process to review citations and appeals. Originally, an appeal had to be requested within 21 days and required a \$50 bond. Since the program has been in operation, the ordinance has been amended to remove the bond requirement. The rationale for eliminating the bond for an appeal was that it may be perceived as restricting due process. Furthermore, the 21-day requirement was extended to 28 days by City staff. The language on the citations instructing citizens how to pay or appeal reflects these changes.

To summarize, if a motorist is ticketed for a red light violation by a police officer they are subject to fine and court cost of \$125, three points assigned to their driving record, and insurance points assigned that may raise their insurance premiums. If a motorist is ticketed for a red light violation by automated photo enforcement, they are subject to a maximum penalty of \$50 and no points are assigned to the driving record or insurance coverage.

5.3 LEGAL CHALLENGES

To date, there have been a number of legal challenges to red light photo enforcement programs across the country. In 2003, the Federal Highway Administration (FHWA) published a report titled *Guidance for Using Red Light Cameras* that included a significant review of previous and pending lawsuits related to red light camera operations and citations. Their review found that a number of cases have challenged the constitutionality of photo enforcement of red light running violations, but the decisions handed down tended to be based on procedural grounds. To date, there has not been a binding decision that addresses the constitutionality of red light cameras.

The FHWA report provides potential issues with red light photo enforcement programs that have been raised in past cases or may be raised in the future. Some procedural issues raised include:

- Authentication of photographs
- Chain of evidence of photographs

- Misuse or dissemination of photographs
- Equipment reliability
- Proper use of advance warning signs
- Compliance with enabling statutes
- Municipal drafting
- Compliance with applicable state rules for service

In addition, the FHWA listed some substantive issues that include:

- Due Process rights (14th Amendment)
- Confrontation rights (6th Amendment)
- Right to remain silent (5th Amendment)
- Search and seizure rights (4th Amendment)
- Equal protection
- Privacy
- Revenue generation and distribution
- Presumption that the registered owner is the driver of the vehicle

Overall, red light cameras are a relatively new enforcement technique in the United States and there isn't a significant case history to build upon. The cases to date appear to uphold the procedural aspects of red light photo enforcement programs and the governing legislation. Future cases will likely deal more with constitutionality issues and may affect how violations are recorded and citations are served. Greensboro needs to continue to be aware of the potential legal issues that exist nationally and continue to plan and operate the SafeLight program in light of these legal concerns.

5.4 HIGH POINT LAWSUIT

In May of 2001, a High Point citizen received a citation in the mail for a red light running violation in the City of High Point (part of SafeLight Piedmont) that was recorded by camera enforcement. The citizen did not appeal the citation and paid no money to SafeLight Piedmont. In June of 2001 the citizen filed suit in North Carolina state court against the City of High Point, Peek Traffic (the contractor operating the SafeLight Piedmont program), and EDS Corporation (a subcontractor to Peek Traffic). The suit made seven claims for relief as listed below.

1. Violation of State and Federal Due Process Rights – The citizen claimed that his due process rights were violated because the citation was mailed to the vehicle owner and presumed guilt, the appeals process is not a fair process and denies the opportunity to confront and cross examine witnesses, the photographic technology used is not reliable and fails 59% of the time, and other similar issues.
2. Violation of State and Federal Equal Protection Rights – The citizen claimed that his equal protection rights were violated because he was presumed to have committed an illegal act and denied a trial by jury, and persons charged with red light running at non-photo enforced intersections are granted a trial. The citizen claimed that this creates two classes of offenders for the same violation and thus denies equal protection of the laws.
3. Violation of the North Carolina Constitution – The citizen claimed that the North Carolina statute that authorizes red light photo enforcement provides an appeals process that is in direct violation of the North Carolina Constitution.

4. Violation of United States Code – The citizen claimed that laws to prevent the disclosure of personal information obtained from a department of motor vehicles records were violated. The citizen claimed that the City of High Point is an authorized recipient of DMV information, but not Peek Traffic and EDS since the citizen claimed they are not an agent or employee of the City.
5. Unlawful taxation by the City of High Point – The citizen claimed that the contract between the City and Peek Traffic constitutes an illegal use of police power for the sole purpose of generating revenue.
6. Violation of the North Carolina Constitution – The North Carolina Constitution states that the legislative, executive, and judicial powers of the government should be separate. The citizen claimed that the statute authorizing red light photo enforcement violates this by giving municipalities the combined power to issue citations (executive power), establish an appeals process (legislative power), and to hear appeals (judicial power).
7. Unconstitutional diversion of fines and penalties (Alternative Claim for Relief) – The citizen claimed that the City of High Point is not entitled to keep proceeds from the citations, but instead this money should be given to the Guilford County Board of Education since the North Carolina Constitution states that all “clear proceeds” of penalties and fines be given to the local school system.

This case was eventually moved to federal district court by the defendants. In addition, the Guilford County Board of Education answered the complaint and filed a cross-claim saying they were entitled to the proceeds from the program. In July of 2003, the district judge granted judgment in favor of the defendants (City of High Point, Peek Traffic, and EDS) on the federal claims (numbers 1, 2, and 4 above) and deferred the state claims (numbers 3, 5, and 6 above) back to the state court. The federal judge did make a ruling on the final claim, defined as a state claim, and ruled that the City of High Point was entitled to the red light photo enforcement program proceeds and not the Guilford County Board of Education.

This decision by the district court was not appealed by the citizen. However, the school board did appeal the decision. In June of 2004, the US Court of Appeals for the 4th Circuit ruled that the district court did not have subject-matter on the school board’s claim and vacated their decision that the City of High Point is entitled to keep the program’s proceeds. The court also ordered that the claim be remanded to the state court.

The result of this string of claims and appeals appears to be that the citizen’s rights were not violated by the red light photo enforcement program and the governing laws and ordinances are legitimate. However, the major legal issue has become whether the City of High Point can retain the proceeds from the citations or if the money should be given to the school system. This claim has not been ruled on by the state court as of yet.

The effect of this lawsuit on the red light program run by the City of Greensboro is only directed at how the proceeds are distributed. The fact remains that the goal of the program is to enhance public safety instead of earning revenue and that the City does not expend any capital or operational budgeted funds to operate or maintain the program. If the court rules that the program proceeds must be distributed to the school system, the impact on the program operations will be negligible. The City will not have the additional funds currently generated by the program to supplement their safety program

budget. The City is currently holding the majority of the funds awaiting the outcome of this lawsuit.

5.5 PROGRAM COMPLIANCE WITH STATE AND LOCAL LAWS

The operations of Greensboro's SafeLight program are fully compliant with state and local laws. In fact, the program has extended the due date for citations from the period stated in the Greensboro ordinance. In January 2003 the City made a policy decision to extend the period for an individual to pay or appeal a citation from 21 to 28 days. The purpose of this change was to be more consistent with other City payment processes and hopefully increase the collection rate for penalties.

In addition, generally for citations to be upheld in court, the yellow and red clearance times should have a reasonably accepted engineering justification. In North Carolina, the amendment to the General Statutes requires the clearance times to comply with times and calculation methods that are contained in the Design Manual published by the Signals and Geometric Section of NCDOT. The yellow change and red clearance intervals are used in traffic signals to allow motorists approaching the intersection to have sufficient time to clear the intersection at the termination of the green before displaying a green indication to the conflicting traffic. The amount of time given is a function of the posted or average speed, the grade of the approach, and the width of the intersection that vehicles must traverse.

At the beginning of the SafeLight program in Greensboro, the times and methodology needed only to be adequate and defensible. In July 2001, the North Carolina General Assembly amended the red light camera legislation to require that the clearance intervals at monitored intersections be no less than the clearance intervals specified in the Design Manual. In March 2002, NCDOT revised their practice for determining yellow change and red clearance intervals. At that time, the City of Greensboro examined the SafeLight intersections to determine if they met the new standards published in the manual. The four following intersections were found to have yellow clearance intervals shorter than the new NCDOT standard and were changed.

- 602 Wendover Avenue at English Street
- 605 Wendover Avenue at Church Street
- 617 Wendover Avenue at Hill Street
- 618 Wendover Avenue at Bridford Parkway

The old clearance times were adequate and did not compromise the safety of the intersection but did not meet the new standards established by NCDOT, which is required according to the amendment to the legislation. Citations that were issued between the legislative amendment and the implementation of the new clearance times were dismissed if appealed.

6 PROGRAM OPERATIONS REVIEW

This section of the report presents summaries of operations of SafeLight programs in three cities in North Carolina: Fayetteville, Rocky Mount and Wilmington. All three cities had programs operational at the same time as the Greensboro SafeLight program. This section also addresses the Federal Highway Administration guidelines for operating a photo enforcement system and notes how the Greensboro system complies with these guidelines.

6.1 NORTH CAROLINA RED LIGHT PHOTO ENFORCEMENT PROGRAMS

Currently, there are eight red light photo enforcement programs in the North Carolina cities of Cary, Charlotte, Fayetteville, Greensboro, High Point, Raleigh, Rocky Mount, and Wilmington. Chapel Hill terminated their program and Knightdale is installing cameras at a single intersection. Each program uses the SafeLight name, but is operated by the individual municipality. **Table 10** lists the red light programs and general information about each.

Table 10. North Carolina Red Light Programs

City	Program Initiation	Number of Cameras	Contractor
Cary	2004	4 (will expand to 16)	Redflex
Charlotte	1998	20	ACS
Charlotte	2004 (second contract)	20	Peek Traffic
Fayetteville	2000	8	ACS
Greensboro	2001	18	Peek Traffic
High Point	2001	10	Peek Traffic
Knightdale	2004	2 (at one intersection)	Redflex
Raleigh	2003	7	ACS
Rocky Mount	2002	6	Peek Traffic
Wilmington	2000	10	Peek Traffic

In general, all of the programs in North Carolina are very similar in development and operations. In fact, there is significant communications and resource sharing among all of the municipalities in the state that have red light photo enforcement programs. The municipalities hold biannual SafeLight conferences to coordinate efforts and develop consistent approaches and exchange success stories. This level of cooperation and sharing has resulted in SafeLight programs that operate similarly throughout the State.

All programs have the primary goal of reducing traffic accidents and improving safety at signalized intersections. The intersections chosen for photo enforcement were selected by the municipality and contractor based on accident rates, red light running violations, citizen complaints, and other similar factors.

All programs have similar camera operations where inductive loops in the pavement are used to detect vehicles running a red light. The camera takes a picture of the vehicle at the stop line with the red light visible and then of the vehicle in the intersection (past the stop line) with the red light visible. All cameras take pictures of the rear of the vehicle; none of the programs in North Carolina take a picture of the vehicle occupants. All

photos are time stamped and include other information such as yellow clearance time, red interval time, and the vehicle's detected speed.

All programs use the same sign alerting drivers to the presence of a camera at the intersection. It is a black-on-white regulatory sign that reads "RED LIGHT PHOTO ENFORCED" with a color graphic of a three-section traffic signal head. This sign is posted on all approaches of an intersection regardless of the number of approaches that are actually enforced with cameras.

Citations are handled similarly by each municipality in the state. North Carolina law dictates that the penalty for being caught running a red light by photo enforcement is a civil penalty with a fine not to exceed \$50. The citation does not result in drivers license points or increases in automobile insurance. After a camera records a violation, the photographs are reviewed independently by multiple parties of the contractor and municipality before a citation is issued. For each program, the citations are mailed to the vehicle owner according to DMV records. Persons cited are entitled to an appeals process for each program. An independent hearing officer reviews each appeal to either uphold or repeal the original citation.

The operation of the Greensboro SafeLight program was discussed in **Section 1.1**. Next, the program is compared to programs in three other cities in the state: Fayetteville, Rocky Mount, and Wilmington.

6.1.1 FAYETTEVILLE SAFE LIGHT PROGRAM

The City of Fayetteville implemented the SafeLight program in 2000 by hiring ACS and has expanded to eight cameras at seven intersections. According to Rusty Thompson, program manager for the City, the program averages about 1,000 citations per month for all seven intersections. After two years of operation, a preliminary study was completed on the enforced intersections (which numbered five at the time). The study found that angle accidents decreased at two locations, increased at two locations, and remained the same at one location. The program is similar to the Greensboro program, but with a few distinguishing characteristics.

First, the site selection process included a large committee of stakeholders. Each stakeholder prepared a list of the top ten intersections they felt would benefit from red light cameras based on their particular criteria. These lists were combined to form the committee's top 30 intersections for red light camera installations. The contractor then surveyed each location for red light running violations, and five locations were initially chosen for camera installations.

Second, Fayetteville uses a longer grace period before the cameras will record a violation. The cameras have a grace period of three-tenths of a second compared to the two-tenths of a second used in Greensboro. Theoretically, this increase in the grace period would reduce the number of violations recorded at the same intersection. But the extent of this reduction is not expected to be of a significant magnitude. Different grace periods are used in other programs because of varying philosophies of perception-reaction times for drivers.

Third, unlike Greensboro, the cameras deployed in Fayetteville are not digital cameras, but rather conventional “wet film” cameras. These cameras store the photos on rolls of film that must be manually retrieved from the camera and developed. Wet film, once the industry standard, has been replaced by digital technology as the standard installed in new systems.

Finally, SafeLight Fayetteville has an overwhelmingly positive perception among the residents. According to the program manager, the citizens are openly supportive of the program, and the local media has not questioned the program or its processes. This appears to be distinctive for North Carolina and also the U.S. where opposition to red light cameras is more typical than support. The City is considering expanding their system into newly annexed areas to the west of the city.

6.1.2 ROCKY MOUNT SAFELIGHT PROGRAM

The City of Rocky Mount began red light photo enforcement in 2002. Their program, managed by Jonathan Boone with the City, now consists of six cameras and averages close to four citations per camera each day. One year into the red light photo enforcement program, City staff conducted a before-and-after study of the number of crashes. This study did not address the issue of regression to the mean but did report a reduction in all of the measures of effectiveness (MOE) including total crashes, angle crashes and rear end crashes for the monitored approaches as well as a decrease in citations.

The program is operated by Peek Traffic, the same contractor used in Greensboro. Thus, the two programs are similar in operation. The system uses the same two-tenths of a second grace period being used in Greensboro. The cameras operate in a similar fashion, and violations are subject to the same multiple review process.

6.1.3 WILMINGTON SAFELIGHT PROGRAM

The City of Wilmington began red light photo enforcement at a single intersection in March of 2000. The program has since expanded to ten locations. The intersections to be enforced were chosen by project manager Jim Flechtner, the City Engineer, and staff after identifying locations with high levels of accidents and red light violations where conventional engineering improvements were not possible or effective. During its second year of operation, a study showed that the total number of accidents at enforced intersections decreased 21% from a similar time period before the cameras were installed. Similarly, it was reported that angle accidents decreased 23% and rear-end accidents decreased 5%.

One area of the Wilmington program that distinguishes it from others in North Carolina is public information. Before implementing the program, the City developed a detailed marketing and public information strategy with assistance from business students at UNC-Wilmington. The City has worked alongside the local media to educate and inform them on the program and its benefits. One local news program features a popular “photo of the week” segment that shows actual red light running violations. The City’s information strategy has resulted in overwhelming support for the program with one survey reporting that 85% of City residents believe the program is beneficial.

In terms of camera operations and citation processing, the Wilmington program is similar to Greensboro's program. Both systems also have the same contractor, Peek Traffic.

6.2 FEDERAL GUIDELINES FOR RED LIGHT PHOTO ENFORCEMENT PROGRAMS

The 2003 FHWA report *Guidance for Using Red Light Cameras* was in response to the rapid deployment of red light photo enforcement programs in the United States and the often inconsistent implementation of these programs. The FHWA presented proven and effective practices to provide guidance in addressing red light runners and how to implement a red light photo enforcement program if deemed beneficial.

The guidelines were published by the FHWA two years after Greensboro had a red light camera installed and operational. However, Greensboro's red light photo enforcement program adheres to and follows the majority of the guidelines. For example, the guidelines call for a detailed process for early planning and startup that includes:

- Establishing an oversight committee including many stakeholders
- Establishing program objectives that are clearly defined, address the reduction of collisions at signalized intersections resulting from red light running, and address specific operational needs
- Identifying the legal requirements of implementing a red light photo enforcement program
- Developing a public awareness and information campaign that uses non-technical terms to describe the program's objectives, operations, advantages, and use of revenue

In terms of site selection, the guidelines outline a process based on actual crash data and red light violations data. Other criteria to consider are recommendations from law enforcement and traffic safety professionals and citizen complaints. According to the guidelines the final sites selected for red light cameras should be historically unsafe intersections based on available data and intersections where an engineering study has concluded that engineering improvements and other countermeasures would not be effective in reducing crashes due to red light running.

Greensboro's red light photo enforcement program also follows the federal guidelines related to processing violations and issuing citations. The FHWA guidelines call for this process to be comprehensive, clearly documented in writing, and followed without exception. There must be a specific definition of a red light running violation and a citation must be reviewed for compliance with the guidelines by two independent persons before it can be issued. Greensboro has a total of three reviews: two by Peek Traffic personnel and the final review by City staff. Finally, the guidelines discuss a continuous analysis of violation and crash data to determine how the program is meeting its goals and objectives.

The one area where the Greensboro program deviates from the FHWA guidelines relates to system procurement and contracting. The guidelines present many options for procuring red light camera systems ranging from the agency to a private contractor

taking full responsibility for construction and operations. Regardless of the arrangement, the agency should have complete oversight of the program's operations. A final recommendation for procurement is that when a private contractor is responsible for processing citations, the contractor's compensation should not be based on the number of citations issued (i.e., receiving a percentage of the citation fines). The FHWA feels that this type of payment arrangement can be a conflict of interest and may impair judgment on the installation and operation of the red light camera system.

In Greensboro's agreement with Peek Traffic, the contractor receives a portion of each citation fee. This method is legal and similar to all red light programs in the State with the exception of Raleigh, a fairly new program that began operations in 2003. Raleigh's red light photo enforcement program pays a flat fee to the contractor to provide the equipment, maintenance, and operations of the system. To avoid the potential conflict of interest as identified by FHWA, the programs that pay a portion of fines to a contractor have set up the citation process where the final decision for issuing a citation rests with the agency and not the contractor. In addition, Greensboro's payments to Peek Traffic are on a scale that pays a smaller portion of the \$50 citation to Peek as the total revenues rise.

7 PROGRAM FINANCIAL REVIEW

According to the City, the revenue collected from the over 89,000 citations issued during the three year SafeLight program has exceeded \$3.4 million. During this time, Greensboro paid Peek Traffic approximately \$2.3 million to operate the program according to the payment schedule in the contract. Greensboro spent nearly \$150,000 on adjudication for those who appealed the citations and paid over \$8,000 to the Department of Motor Vehicles to allow Peek Traffic to access vehicle registration records.

With the remaining funds from the citations, the City has contributed to safety programs. The City helped to fund the Neighborhood Speed Watch and Pace Car program. These programs attempt to lower speeds in the City through various initiatives. Specifically, some of the photo enforcement revenues were spent purchasing radar/display units for citizens to use in their neighborhoods to help combat speeding. The City also purchased 30 portable generators to power traffic signals during power outages that can occur due to storm events. Providing temporary power to signals in critical areas will help maintain order and minimize congestion and crashes during prolonged power outages. Lastly, the income from the citations paid Kimley-Horn and Associates, Inc., to perform this study and prepare this report. After the SafeLight costs and the funded safety initiatives, the City retains a balance of nearly \$1 million.

The City has chosen to be conservative with spending the funds until the current legal issues are resolved to avoid any perception by the public of misuse of funds. The funds, when spent, will be allocated to special safety initiatives and to supplement funds budgeted for safety improvements. Necessary safety improvements are not being postponed by delaying spending the SafeLight funds. **Table 11** illustrates collections and expenditures of the program from its inception in 2001 to June 2004

Table 11. SafeLight Financial Summary, 2001-2004

Item	Revenue	Expenditures
Citation Collections	\$3,535,000	
Peek Traffic Contract		\$2,310,905
Adjudication Costs		\$143,600
Safety Program Costs		\$20,410
Program Review		\$49,948
DMV Look Up Charges		\$8,120
Misc. Adjustments		\$2,900
TOTALS	\$3,535,000	\$2,535,883
BALANCE	\$999,117	

8 PROGRAM CONTRACT REVIEW

By the end of 2000, the City had contracted with Peek Traffic to install and maintain the red light camera system with EDS Corporation to serve as the system provider and coordinate citations and fine collections. Originally, the City signed a three-year contract with Peek Traffic to develop and maintain the program. During the contract, Peek Traffic terminated their agreement with EDS and took over all operations of the system. The contract expired May 15, 2004 and the City has renewed on a monthly basis with the contractor. It should be noted that even though the contractor is responsible for the equipment and system processing, the red light program is administered by the City of Greensboro, which is responsible for overseeing Peek Traffic's system operations. The City has a program manager and staff that reviews violations and acts as final decision makers on the issuance of citations.

The original contract between the City and Peek Traffic was signed on October 13, 2000 and a change order dated June 26, 2002 set the effective date of the contract to be May 15, 2001. The contract details the products and services that will be provided by each party to create a program of traffic signal violation photo enforcement. According to the contract, the role of Peek Traffic is "the obtaining and integration of all necessary equipment, computer hardware and software, related infrastructure, citation processing services, and collections." It also states that all equipment will remain the property of Peek Traffic. In addition to processing citations, Peek Traffic also coordinates the appeal hearings including scheduling, review, and document processing. The City contracts directly with the attorneys who serve as hearing officers and pays them for each appeal heard from the revenue generated by the citations.

The contract establishes the administration of the red light photo enforcement program. Peek Traffic is given the responsibility of overall management of the program, at the direction of the City of Greensboro. The City also retains the right to provide an employee to observe the operations of Peek Traffic and be housed in their offices. This employee also acts as the City's representative and liaison.

In terms of customer service, the contract is fairly explicit about what the City expects from Peek Traffic. Peek Traffic is expected to receive and respond to all public inquiries. Peek Traffic also must keep a record of all citizen complaints and actions taken in response. Peek Traffic notes citizen complaints on their individual citations, as well as the resolution to the issues. However, Peek Traffic does not keep a unified list of all complaints over time and does not keep a record of general feedback that is not related to a specific citation. The City states in the contract that all Peek Traffic employees involved in the program must serve the public in a "courteous, helpful, and impartial manner."

The contract establishes the payment schedule and terms for Peek Traffic. All of the money collected from citations is deposited in a City designated account and all expenses are paid from this account. For each \$50 civil penalty collected, Peek Traffic receives:

- \$35 up to a total of \$120,000 for the collection year.
- \$30 when Peek Traffic's collection has exceed \$120,000 but below \$210,000 for the collection year.
- \$27 when Peek Traffic's collection has exceeded \$210,000 for the collection year.

For each \$50 late fee that is submitted by the vehicle owner (in addition to the \$50 civil penalty that is distributed as stated above), Peek Traffic will receive \$28. For each \$50 late fee that is collected through legal action or collection agency, Peek Traffic will receive \$49 in addition to the associated court costs. Finally, should the City request that Peek Traffic relocate a camera and housing to another location, Peek Traffic will receive \$13,500 per location from the City.

The contract also spells out conditions for the termination of the contract. If the contract is terminated prematurely by the City, Peek Traffic is entitled to liquidated damages of

- \$100,000 per camera location if terminated in year 1.
- \$75,000 per camera location if terminated in year 2.
- \$50,000 per camera location if terminated in year 3.

All liquidated damages are not to exceed the cap of 80% of the net share of revenue from citation collections. Finally, Peek Traffic also has the option to renegotiate the contract terms if the number of citations falls below 12 citations per monitored approach per day when averaged over 90 days for all locations.

The City of Greensboro made no up-front payments to Peek Traffic to cover their start-up costs. The money is paid to the City from the citations, and Greensboro pays Peek based on the above contract terms.

Red light camera contracts between municipalities and contractors can have many variations. A critical portion of such contracts is the language addressing collection or revenue and payment.

There are generally two ways a contractor can be paid by a municipality. The first is a lump sum payment agreement, whether the negotiated fee is for the total program or whether it is per location or per year. The FHWA recommends this type of payment method in red light program contracts because it reduces the perception that the contractors are operating the program to maximize revenue rather than improve safety. A drawback to this method is that the municipality may overpay for the program, because the costs may not be known before implementation and the payments to the contractor are not tied in any way to performance.

The second way that contractors can be paid is on a per-citation basis. The split of revenue generated from citations between the contractor and the municipality varies from city to city according to their contracts, but are typically heavily weighted toward the contractor. This is because the operation is not intended to be a revenue generating program for the cities. The goal of the program is to improve safety. The funds generated above the costs of the program are used by cities or county school districts to fund other traffic safety initiatives.

Contracting for payment on a per-citation basis encourages contractors to keep the systems well maintained and operational. Because of the checks and balances in the system and the right of citizens to appeal, contractors will only be paid from valid issued citations. A drawback to the per-citation payments is the perception that contractors may make questionable decisions affecting system operation to increase the number of violations and boost their revenue.

In Greensboro, which has a per-citation payment contract, the City selected the sites and set the clearance times. The system includes a grace period after the light changes from yellow to red before a violation is considered to have occurred. Finally, the percentage of payment to the contractor from each citation decreases as the number of citations increases. The contractor has little ability or incentive to make changes to increase the numbers of valid citations issued.

As the City considers a new contract for the Safelight program, there are a couple of options for moving forward:

- Consider the lump sum contract as recommended by FHWA rather than the per-citation payment schedule.
- Consider removing the contract language allowing the contractor to renegotiate, or get out of, the contract if citations fall below a certain number.

9 CONCLUSIONS AND RECOMMENDATIONS

The City of Greensboro is achieving each of its three objectives with the SafeLight program. Violations are decreasing; crashes, particularly the more severe type, have decreased over time; police are able to spend their time on other issues; and the public has been made aware of the danger of red light running.

The results of the citation analysis reveal a 17% decrease in monthly citations at the 18 Greensboro SafeLight intersections from 2001 to 2004. Some locations saw greater reductions in violations than others. The greatest reduction was seen at the intersection of Wendover Avenue and Bridford Parkway with a nearly 68% decrease in citations. Some intersections saw increases in monthly citations. Overall, 13 of the 18 intersections saw significant reductions in citations (greater than 10% decrease), two intersections saw significant increases in citations, and the remaining three intersections saw little effect in citations from photo enforcement. Intersection selection may have contributed to the results. Other programs around the world have reported reductions in violations ranging from 20% to 80%. The average citations per month for many of the intersections were higher in the first part of 2004 than averages from other years. A greater reduction in the average monthly citations may be seen later in 2004 by including months of the year with traditionally lighter traffic. Traffic is typically lighter during the summer when schools are on break, resulting in fewer violations.

During the course of the study, each intersection was visited, photos were taken, and field observations made. It appeared that some intersections have good sight distance and no congestion or speed issues that would cause red light running. These intersections had the lowest numbers of citations (and therefore were the lowest revenue generators) but did experience a decline in red light running. The addition of the camera had an impact on drivers at these locations, which include Cone Boulevard at Church Street, Wendover Avenue at Bridford Parkway, and Spring Street at Friendly Avenue.

Other locations that appeared in the field to have other factors for driver inattention (as discussed in **Section 2.3**) saw little or no reductions in citation rates after the first year. Examples are Randleman Road at Creek Ridge Road, Holden Road at Merritt Drive, Battleground at Cone Boulevard, Wendover Avenue at Big Tree Way, and Wendover Avenue at Hill Street. It may be that certain factors at these locations are leading to the red light violations more so than the drivers themselves. If this is the case, the cameras will not have as much impact as other measures.

Holden Road at Pinecroft Road saw a steady increase in monthly average citations each year although the approach was straight and level with normal traffic volumes. Battleground Avenue at Brassfield Road also had a straight and level approach, but did not see reductions in annual citations.

The crash analysis results show that total crashes at the 18 intersections reduced by 4%. Angle type crashes were reduced by 14% during the program analysis period. In addition, the EPDO index fell slightly from the before period to the after period of the crash analysis. Further study is necessary to compare the crash history of these locations with other locations to reveal a clearer level of safety but the preliminary numbers are encouraging. To further study the program, crash histories at comparison sites must be obtained and compared to the program locations. These comparison sites should be

unaffected by the SafeLight Greensboro program. Also, crash rate trends for intersections in the City of Greensboro should be examined to reveal the overall level of safety for the City over time.

The red light photo enforcement program is providing a benefit to the City at a much lower cost than that of traditional enforcement, although the improvements appear to be incremental. It is believed from research conducted that greater benefits can be achieved with this program with a few adjustments and additions. Further study and analysis of the numbers of crashes and citations and annual updates to the study could provide additional insights regarding the program's success.

Results from analyses of other photo enforcement systems across the country have been based on different data sets during longer or shorter time periods using various evaluation techniques that this study on the Greensboro SafeLight program. Regardless of the variations, most available reports indicate reductions in crashes from other systems in the double digits. For this reason, it is believed that the Greensboro system is also capable of creating these same results, which are greater than the reductions already seen during the program to date.

Public awareness and support are important to the success of red light photo enforcement programs, as seen in other cities such as Wilmington and Fayetteville. Investing more money and effort in public awareness and media campaigns may decrease citations at the SafeLight intersections and reduce red light running violations at other intersections in Greensboro.

The City should revisit the initial list of candidate locations for the cameras or generate a new list based on more recent crash histories and consider adding locations or moving cameras from less effective to potentially more effective locations. Several of the candidate locations were not chosen because of construction issues that may have resolved themselves during the past 4 years.

The program details are in line with other programs in the area and the federal guidelines with the exception of payment to the contractor. While the federal guidelines recommend against payment per citation because of the impression that it encourages contractors to make choices to maximize revenue, the Greensboro SafeLight contract decreases the revenue from each citation to Peek as the number of citations increases, which reduces the bias. When renewing the SafeLight contract, it is worth considering a lump sum payment schedule or other contracting mechanism.

There does not appear to be an issue with payment of citations by the citizens because the percentage of citations paid annually is high (over 75%), the rate of appeals is small (approximately 3% of all citations issued) and level over the course of the program indicating general support of the SafeLight program.

10 CITATIONS

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Lum, Ph.D., P.E., K. M. and Y. D. Wong. "A Before-and-After Study on Red light Camera Installation." *ITE Journal* (2003): 28–32.

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Appendix A. Sample SafeLight Citation

(2 pages)



City of Greensboro
RED LIGHT CAMERA PROGRAM
4915 Piedmont Parkway, Suite 108, Jamestown, NC 27282
(336) 834 - 9555

SafeLight
Piedmont

NOTICE OF CITATION

Citation Number 633885

MAIL DATE: 07/30/2004

Internet Password: [REDACTED]

Payment Due Date: 07/26/2004
If paid after due date

Amount Due: \$50.00
Amount Due: \$100.00

Amount Paid:

\$

[REDACTED]
[REDACTED]
Greensboro, NC 27401

Contact us on the Internet for
citation information and payments at:

<https://onlineviolation.com/greensboronc>

City of Greensboro
4915 Piedmont Parkway, Suite 108
Jamestown, NC 27282

----- Detach here and return the above portion with your payment -----

Citation Number: 633885

Plate: [REDACTED] NC

On 06/23/2004 at 12:59 PM your vehicle was photographed (copies are shown to the right) entering an intersection in which the traffic signal was red, in violation of Greensboro City Code Section 16.58. The civil penalty for this violation is \$50.00. No points will be assessed against your driving record or insurance as a result of this violation. Please see reverse side for payment options and for a description of the information in the Data Block shown above the photographs.

This program has been initiated to increase roadway safety, reduce red light violations and prevent injuries. If you have any questions regarding this citation, please visit our Internet site or call the office at (336) 834 - 9555

Important Notice: Failure to pay the civil fine by the due date shown above will result in an additional late penalty of \$50.00. Request for appeals and transfer of responsibility must also be received by the due date above or your right to appeal will be waived. For your convenience, you may pay or appeal your citation via the internet at <https://onlineviolation.com/greensboronc>. Please be sure to use the internet password provided above to access your citation.

Amber Time	Red Time	Vehicle Tag No
4.00	.20	[REDACTED]

Date/Time	Location of Violation
06/23/2004 12:59 PM	BATTLEGROUNDS AND CONE

**FOR A SAFER COMMUNITY
STOP ON RED**

07/30/2004 Reprint



APPEAL REQUEST

An appeal request must be accompanied by an explanation for contesting the citation. You will be scheduled for an Administrative Hearing before an independent Hearing Officer. If the Hearing Officer upholds the citation, a civil penalty obligation of \$50 will be due 30 days from the hearing date. If the citation is dismissed, no further action will be required.

Basis for contesting citation (Only those reasons stated in this appeal request may be argued at an administrative hearing. You may attach a separate document stating the basis for contesting the citation if the space provided is not sufficient.)

Your Signature _____
Tag No. _____ Phone (____) _____

AFFIDAVIT TRANSFERRING RESPONSIBILITY*

I _____ (print or type name), being duly sworn, state that I was not driving the vehicle identified in this Notice of Citation at the time of the violation. The name and address of the person or company who had the care, custody and control of the vehicle at the time of the violation is:

Name _____
Address _____

I understand that a new Notice of Citation will be issued to the person I have identified.

Your Signature _____

AFFIDAVIT REPORTING VEHICLE STOLEN*

I _____ (print or type name), being duly sworn, state that the vehicle identified in this Notice of Citation was, at the time, stolen. (You must attach supporting evidence, such as a copy of an insurance or police report).

Your Signature _____

*** Submission of a false affidavit constitutes perjury punishable as a Class F felony.**

Questions & Answers Regarding This Notice

Q. Why did I get this notice of citation?

A. A vehicle registered or leased to you was photographed running a red light by a traffic control photographic system.

Q. Is this notice a moving violation infraction?

B. No, this citation is not considered to be a "traffic infraction". Instead, it is a non-criminal violation for which civil penalties are assessed. No points will be assessed for this violation and it will not affect your insurance.

Q. What are my options?

A. You have the following four options:

- (1) You may accept responsibility and pay the civil penalties (see "Payment Options");
- (2) You may contest (appeal) the citation by providing an explanation for contesting the citation and requesting an administrative hearing (see "Appeal Request")
- (3) If you were not driving the vehicle at the time of the violation, you may submit a notarized affidavit stating that you were not driving and identifying the individual who had possession or was driving at the time. If you choose this option, a new citation will be issued to the individual that you identify (see "Transferring Responsibility"); or
- (4) If the vehicle was stolen at the time of the violation, you may submit a notarized affidavit stating that the vehicle was, at the time, stolen and supporting information such as an insurance or police report (see "Reporting Vehicle Stolen").

If you do not exercise one of the four options within thirty (30) days from the date of the citation, you will be assessed an additional \$50.00 late payment penalty.

Q. How do I arrange for accommodations for persons with disabilities?

A. Any reasonable accommodation for persons with disabilities will be made. Requests should be made prior to visiting the facility by calling (336) 834-9555.

PAYMENT OPTIONS

Checks or money orders should be made payable to the **City of Greensboro**. Do not send cash. If you fail to remit payment or contest the citation within 30 days of the date of the citation, a penalty \$50.00 will be added to the total amount due.

Make sure your name, address, license number and citation number are on your check or money order.

TO PAY BY MAIL

Send Check or money order to:

City of Greensboro
4915 Piedmont Parkway
Suite 108
Jamestown, NC 27282

WALK-IN PAYMENTS

Within 30 days of the date of the citation, bring this notice along with your payment to:

SafeLight Office
4915 Piedmont Parkway
Suite 108
Jamestown, NC 27282 (MasterCard & Visa accepted)

or

Greensboro City Hall
300 W. Washington Street
Greensboro, NC 27402
(Mastercard, Visa, Discover & American Express accepted)

For further information about the SafeLight Program:

Telephone: (336) 834-9555

Write: 4915 Piedmont Parkway
Suite 108
Jamestown, NC 27282

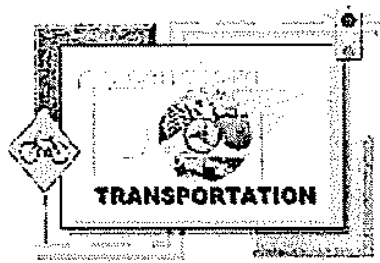
Internet: <http://www.safelightpeidmont.gov>

E-Mail: safelight@ci.greensboro.nc.us

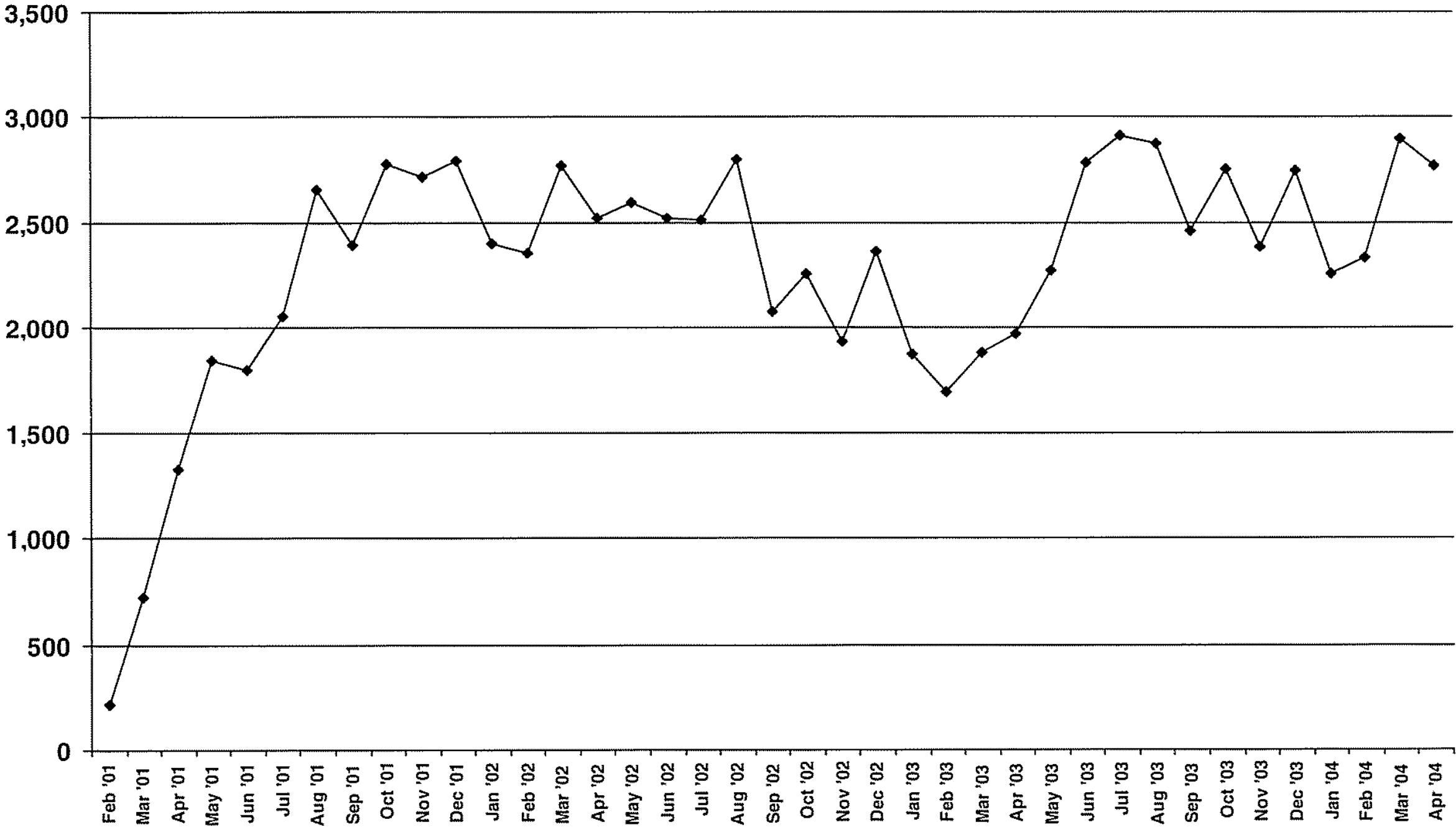
Appendix B. Citation Trends Graphs

(9 pages)

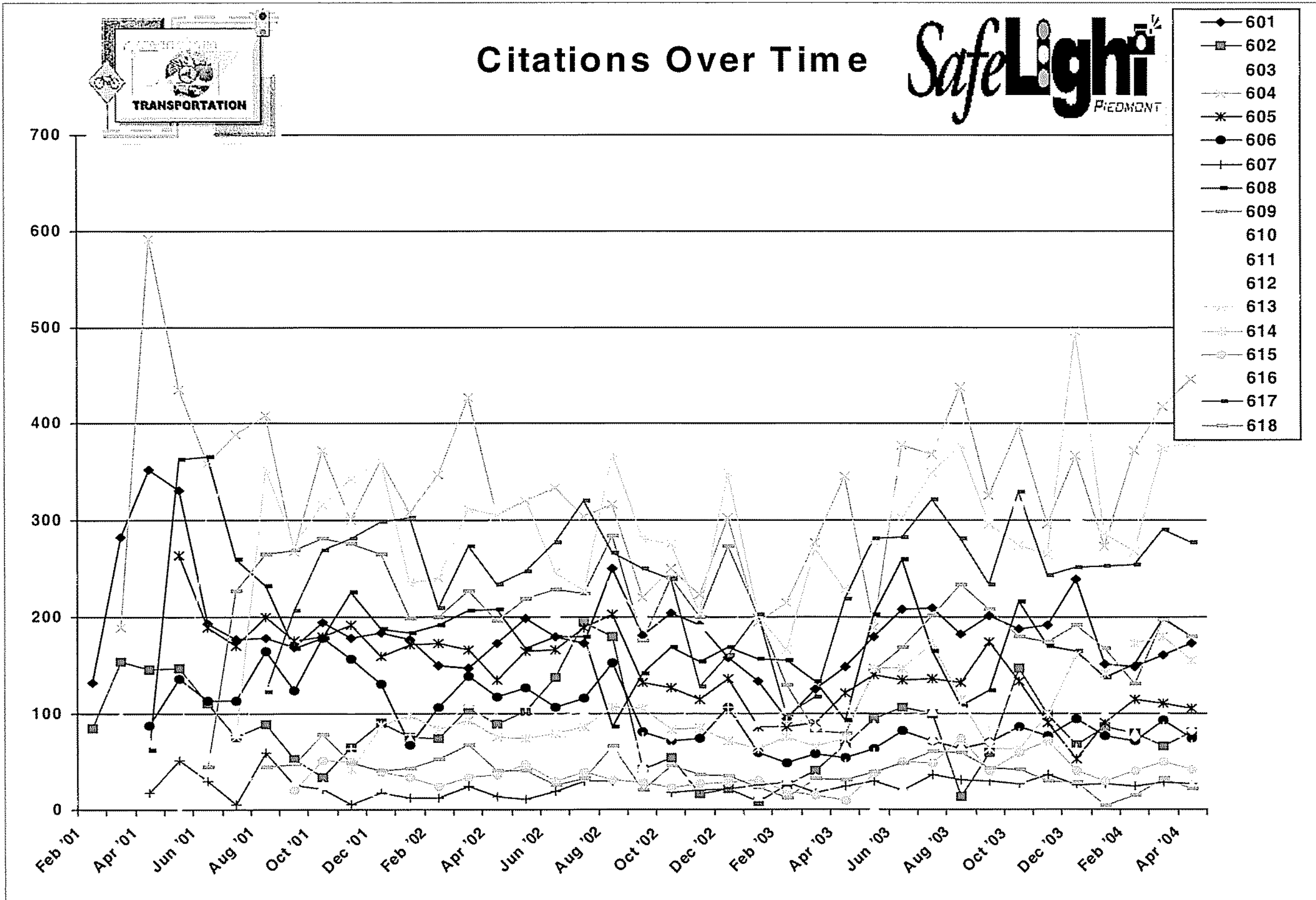
GREENSBORO RED LIGHT CAMERA PROGRAM



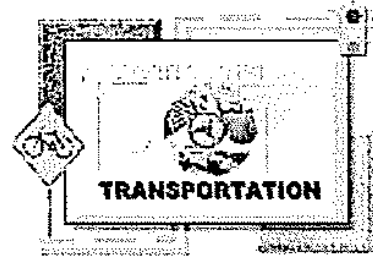
Citations Over Time



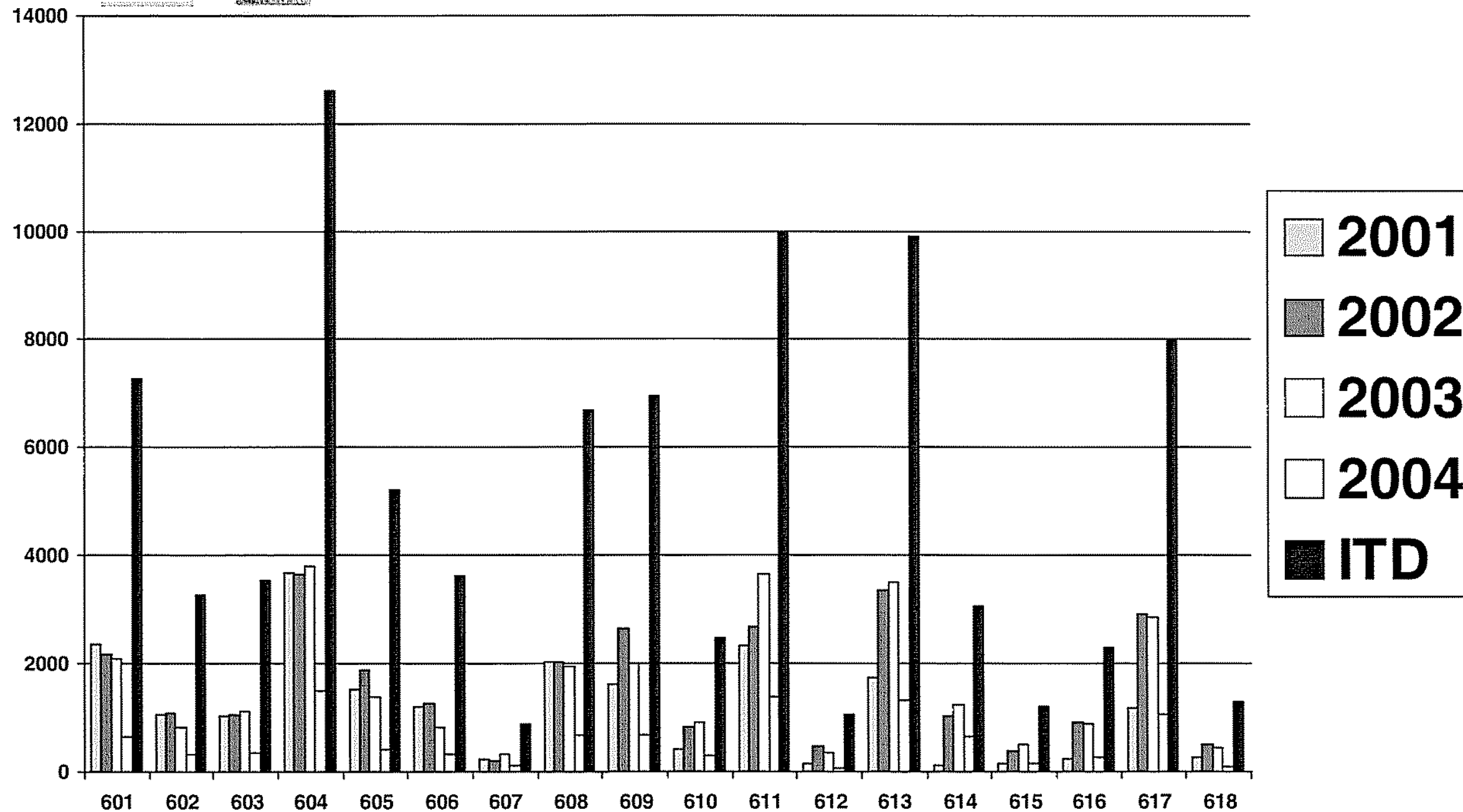
SAFE LIGHT INTERSECTION



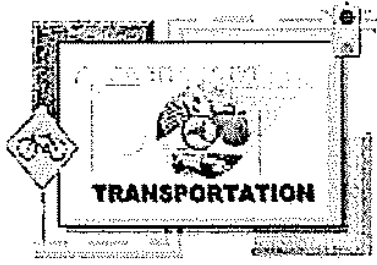
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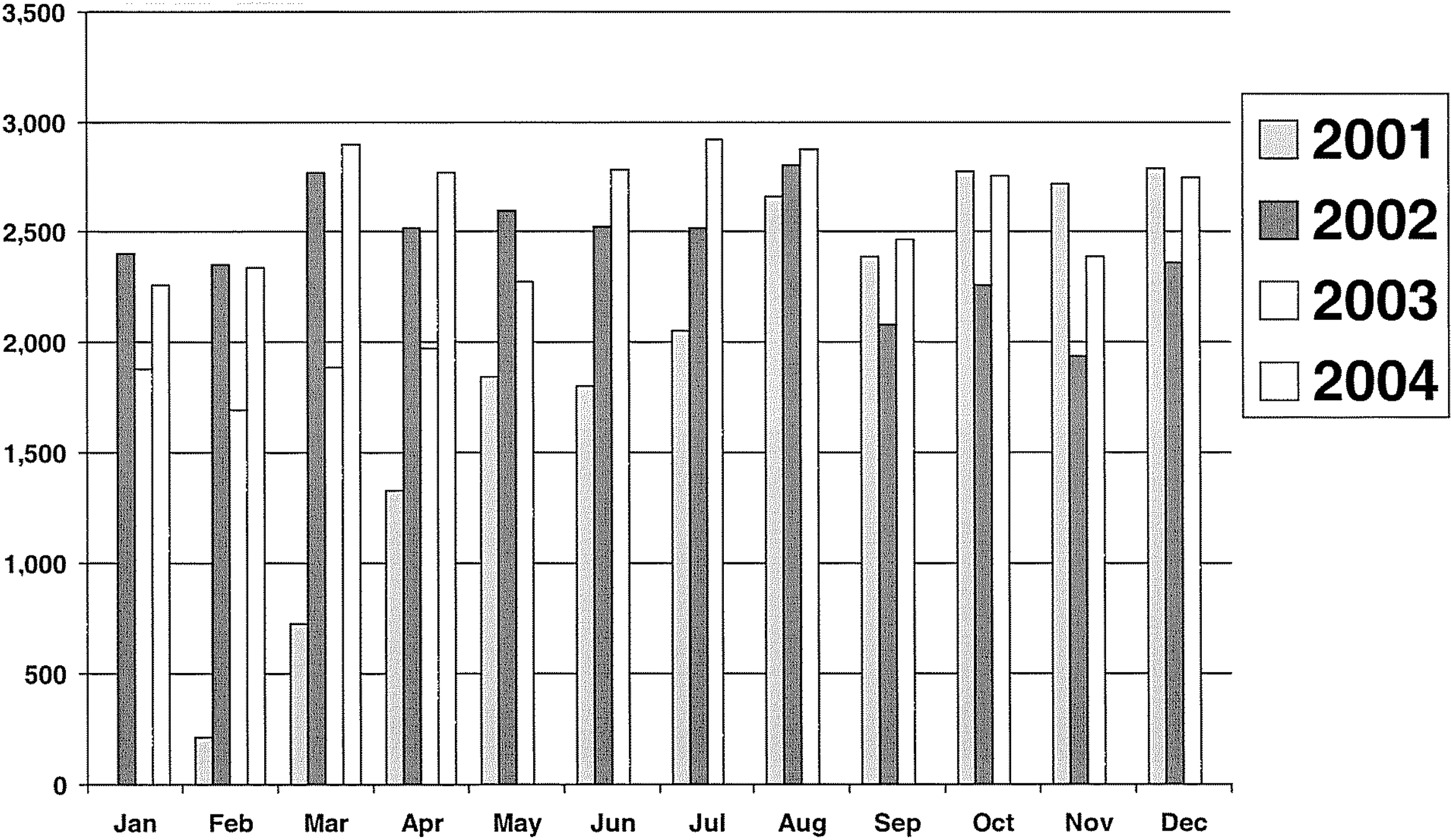
Count by Location



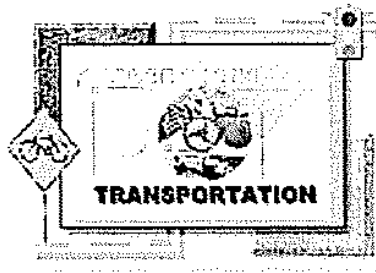
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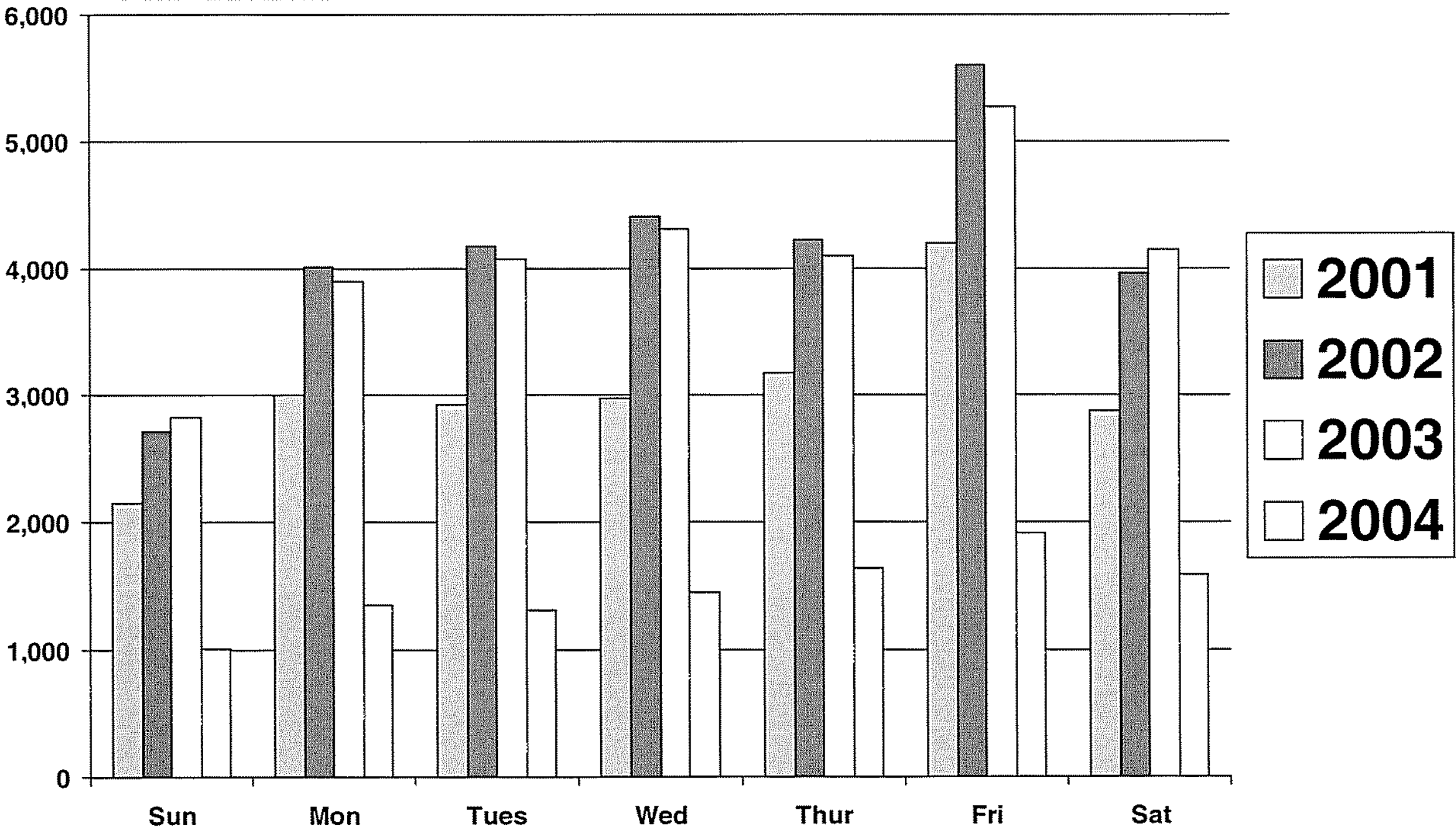
Citations by Month



GREENSBORO RED LIGHT CAMERA PROGRAM



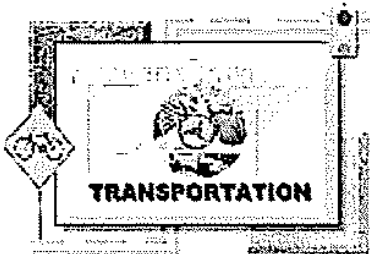
Citations by Day of Week



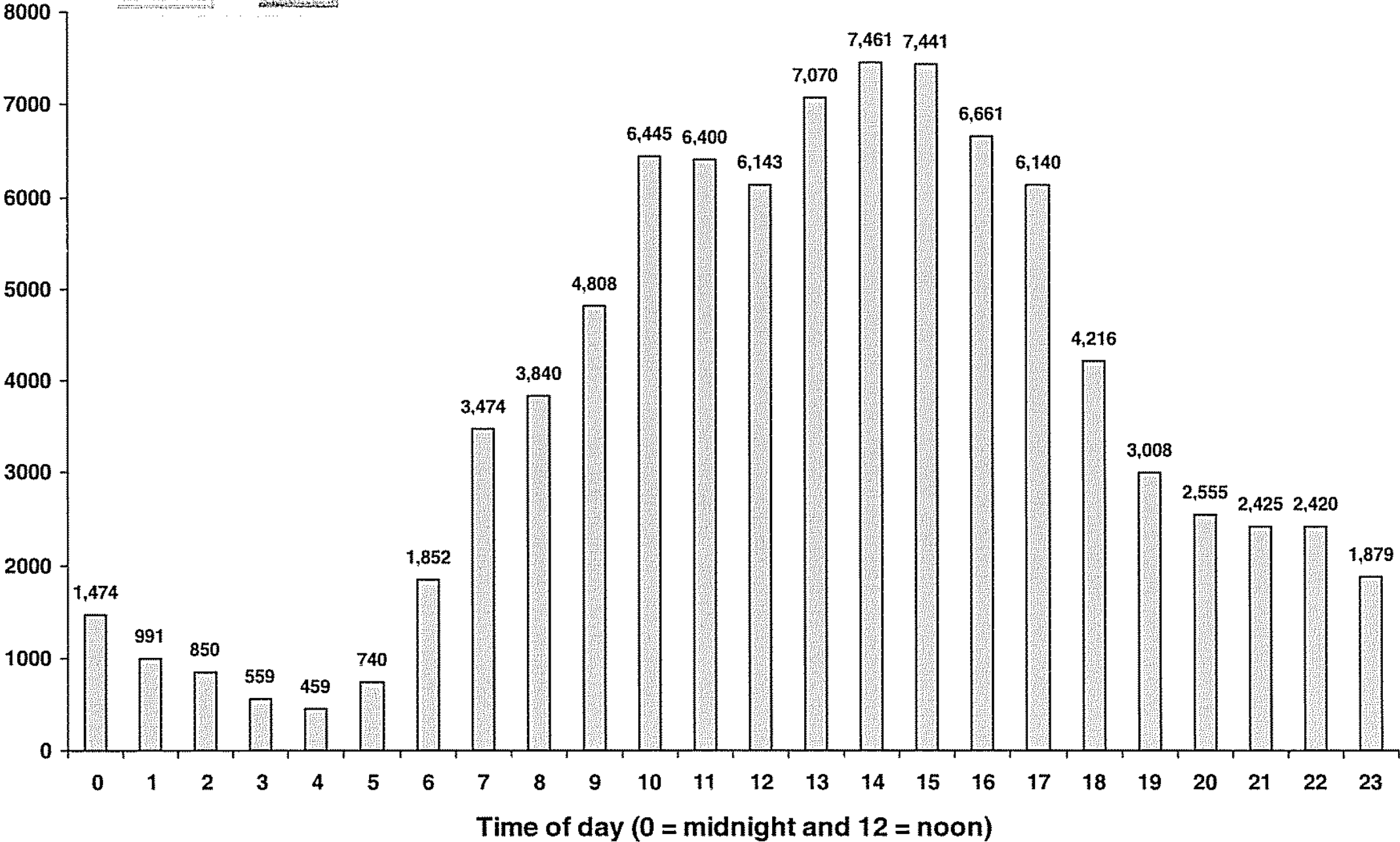
All Locations

Wednesday, July 14, 2004
3:21:12 PM

GREENSBORO RED LIGHT CAMERA PROGRAM

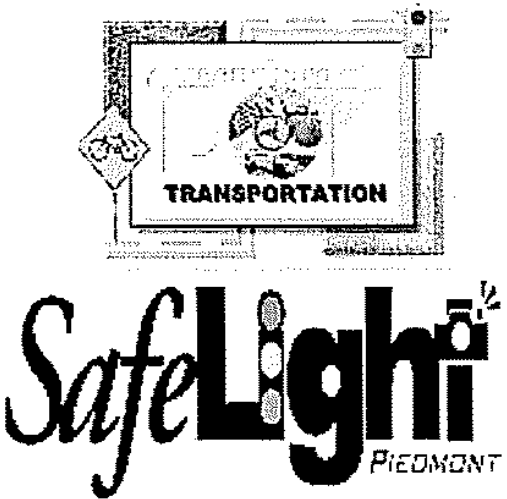
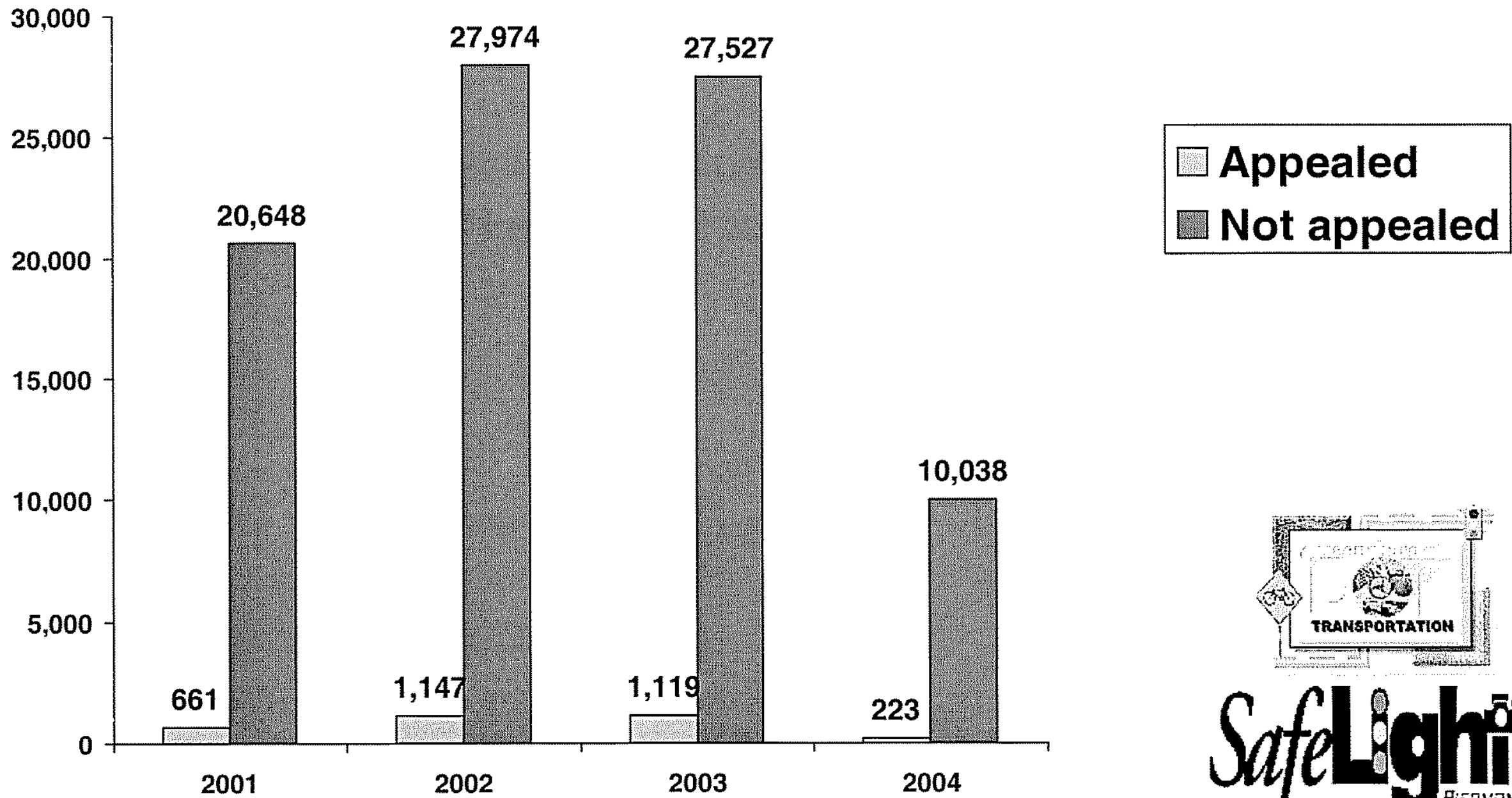


Citations by Hour of Day



GREENSBORO RED LIGHT CAMERA PROGRAM

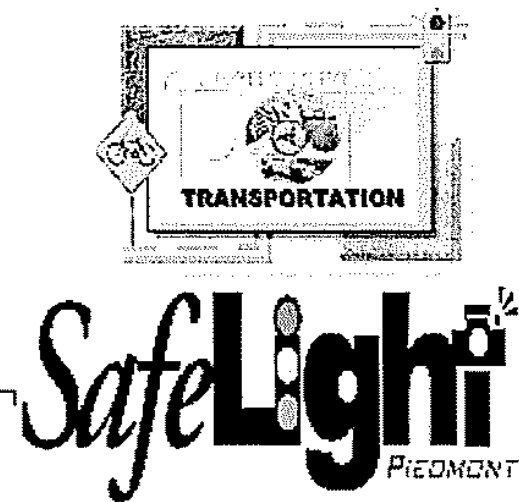
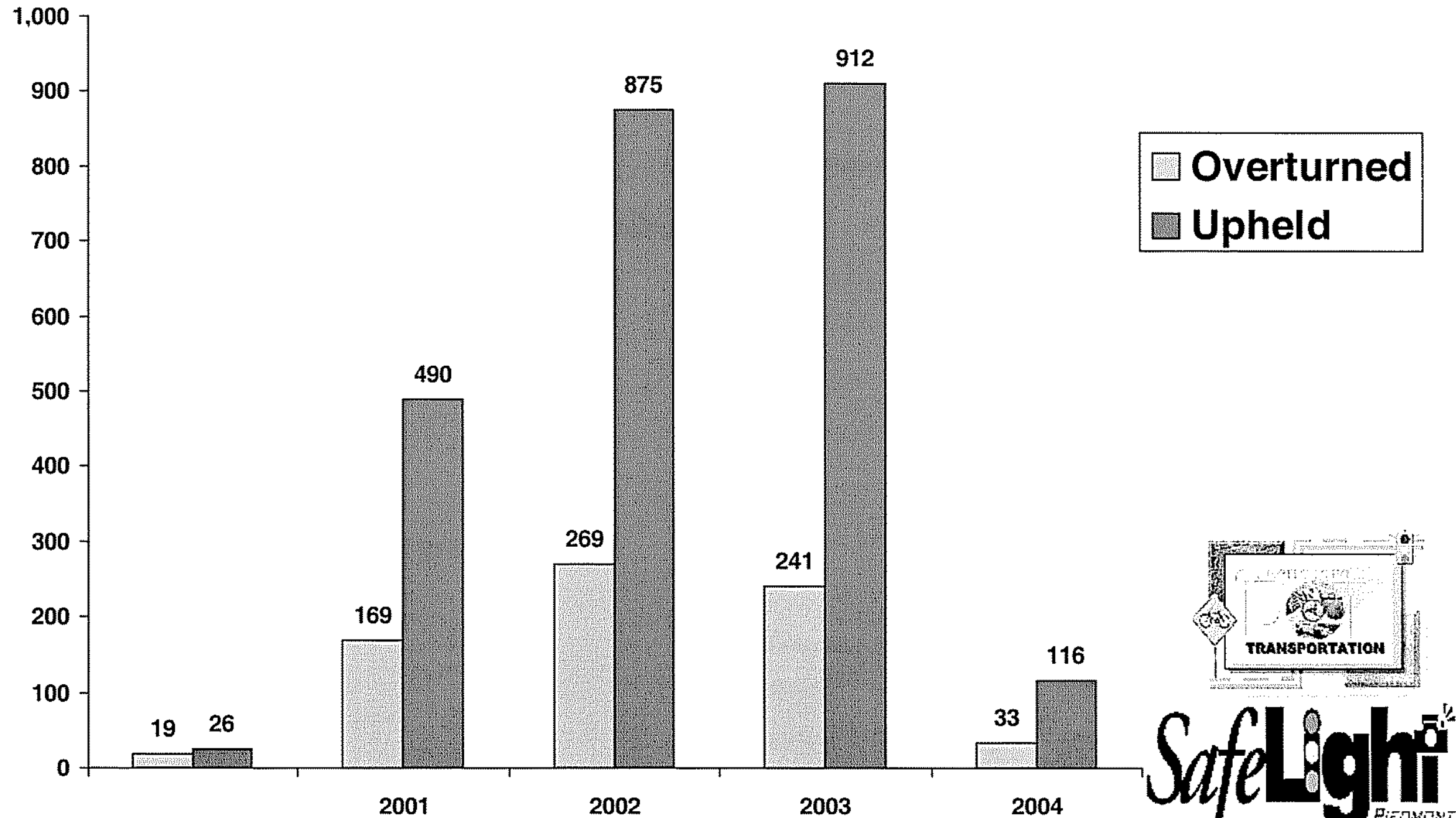
Citations Appealed V. Not Appealed



DATA FOR ALL 18 SAFE LIGHT INTERSECTIONS

GREENSBORO RED LIGHT CAMERA PROGRAM

Appeals: Overturned v. Upheld

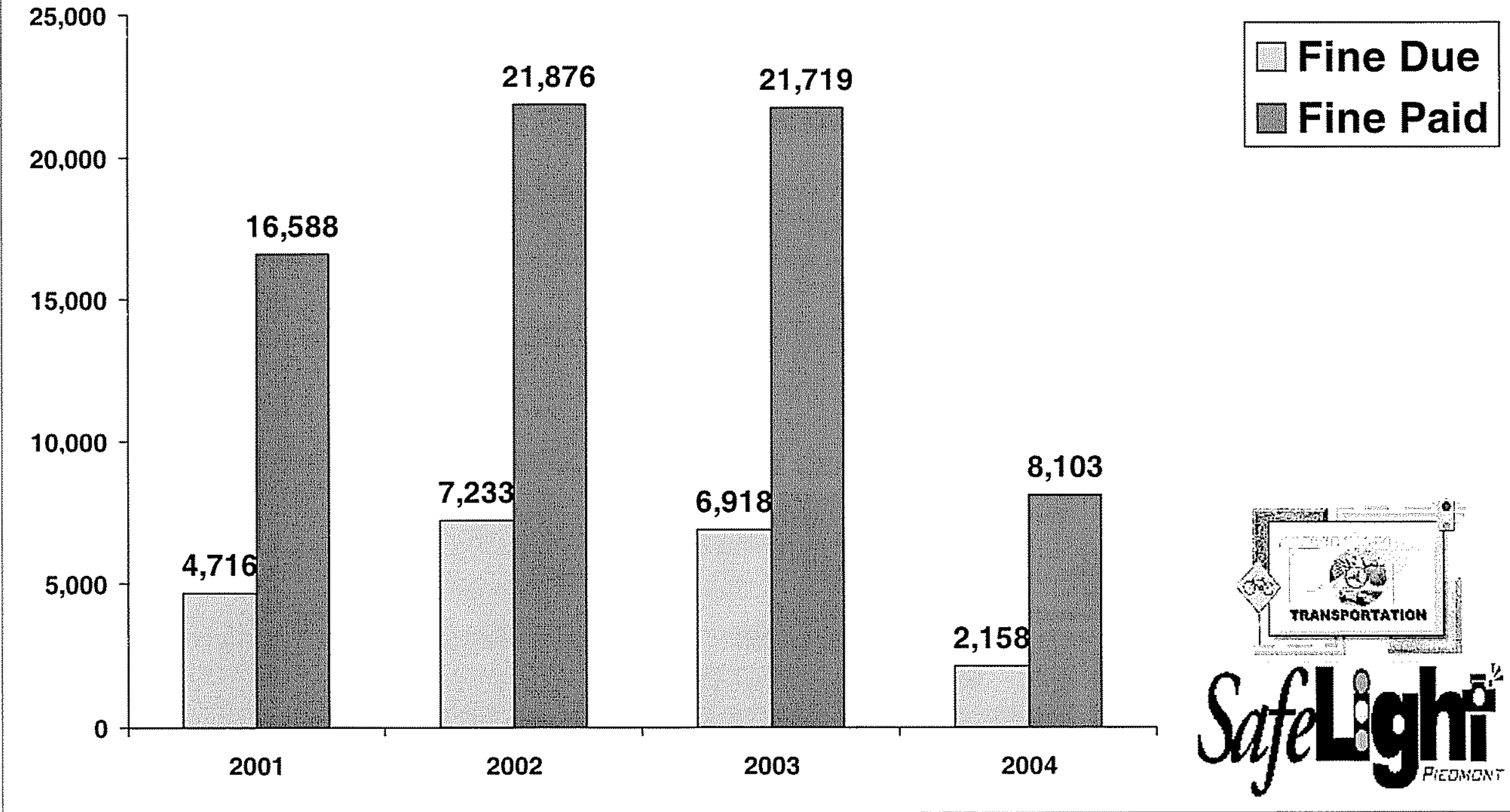


DATA FOR ALL 18 SAFE LIGHT INTERSECTIONS

Wednesday, July 14, 2004
3:22:03 PM

GREENSBORO RED LIGHT CAMERA PROGRAM

Citations: Paid v. Due



DATA FOR ALL 18 SAFE LIGHT INTERSECTIONS

Appendix C. SafeLight Flyer

(2 pages)

SafeLight

PIEDMONT

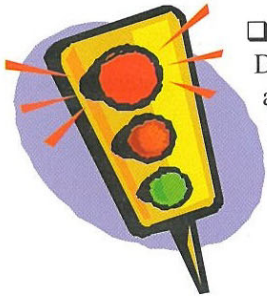
"FOR SAFER COMMUNITIES STOP ON RED"

Fast Facts

- Over 50% of the accidents occurring at intersections with traffic signals are caused by motorists running red lights.
- 56% of local motorists have run red lights and 92% believe accidents are a problem in the Piedmont area.
- Running red lights, stop signs or yield signs are the most frequent causes of urban crashes.
- At one intersection in the Piedmont area, over 195 violations were recorded by the local Police Department in a four day period.

Safety Tips

- Always wear a seat belt, even in the rear seats.
- Keep a safe distance from the vehicle in front of you.
- Allow ample time to reach your destination safely.
- Don't speed to compensate for lost time.
- Be cautious during twilight hours.
- Don't drive when tired or fatigued.
- Never drink and drive!
- Speed kills!
- Drive defensively.



❑ Is Red Light Running A Big Problem?

Drivers who run red lights are responsible for an estimated 260,000 crashes each year, of which approximately 750 are fatal. On a national basis, fatal motor vehicle crashes at traffic signals increased 24 percent between 1992 and 1997, far outpacing the 6 percent rise in all other fatal crashes. Running red lights and other traffic controls like stop and yield signs is the most frequent type of urban crash, Institute research shows. In 2000, the Greensboro Police Department wrote 1,445 tickets for red light running. Studies show that motorists are more likely to be injured in crashes involving red light running than in other types of crashes. Occupant injuries occurred in 45% of the red light running crashes studied, compared with 30% for other crash types.

❑ How Often Do Drivers Run Red Lights?

A study conducted over several months at a busy intersection in Greensboro indicates that motorists frequently run red lights. During 1999, in Greensboro, there were 498 traffic accidents caused by red light running which resulted in 274 personal injuries.

❑ Isn't Conventional Police Enforcement Sufficient?

Enforcing traffic laws in dense urban areas by traditional means poses special difficulties for police who in most cases must follow a violating vehicle through a red light to stop it. This can endanger other motorists and pedestrians as well as officers, and police can't be everywhere at once. Communities don't have the resources to allow police to patrol intersections as often as would be needed to ticket all motorists who run red lights. Consequently few red light runners actually receive tickets, which is why light running has become such a big problem. The cameras allow police to focus on other enforcement needs.

❑ What Safety Benefits Do Red Light Cameras Provide?

They have been shown to reduce red light violations and intersection crashes. A recent Institute study in Oxnard, California shows that red light running violations dropped a total of 42% after cameras were introduced at nine intersections including a similar decline at intersections that were not previously equipped with them. Another study showed violations declined about 40% in Fairfax, Virginia after one year of camera enforcement.



SafeLight's goal is to decrease the number of motorists who run red lights and the accidents they cause.

Cities in the Piedmont area, beginning with Greensboro and High Point, will install cameras at high-accident intersections to monitor and record motorists running red lights.

"Most of the accidents that occur at intersections have a very serious injury pattern, with a high degree of trauma involved."

*Dr. Norman Mayer
Moses Cone Memorial Hospital*

"Red light camera enforcement in conjunction with public awareness can modify driving behavior and has been shown to reduce red light violations and intersection crashes."

Insurance Institute for Highway Safety

"Having red light cameras...will help the police find those people who are running the red lights and endangering everyone else on the road. It's an effective tool to help reduce accidents and save lives."

*David Kelly
Secretary of N.C. Crime Control & Public Safety*

"(SafeLight) can detect and cite motorists who enter a signalized intersection in violation of the red phase and has the potential to reduce fatalities, injuries and crashes by enhancing respect for traffic control devices such as traffic signals."

Federal Highway Administration

What is red light running? A violation occurs when a motorist enters an intersection after the traffic signal has turned red. Motorists already in an intersection when the signal changes to red – when waiting to turn, aren't considered red light runners.

How does SafeLight work? Safelight cameras help communities enforce traffic laws by automatically photographing the license plates of vehicles whose drivers run red lights. The camera systems are installed at high incident intersections and will provide 24-hour traffic surveillance. When a violation occurs, the camera records the date, time, speed of the vehicle, and the time elapsed since the beginning of the red signal. A citation showing a photo of the violation is then sent to the registered owner.

Where will the SafeLight cameras be located? The City's SafeLight cameras will be located at intersections where chronic red light running causes frequent accidents. The locations of the Safelight systems will be expanded in the future as warranted. Signs will clearly mark which intersections are enforced by SafeLight.

When a violation occurs, who receives the citation? SafeLight citations are mailed to the registered vehicle owner.

What if the registered owner was not driving the vehicle? The owner is responsible for returning the citation to the SafeLight Program with information regarding who was driving the vehicle (name, number, address). If the car was reported stolen at the time of the violation, the owner must submit a copy of the filed police report.

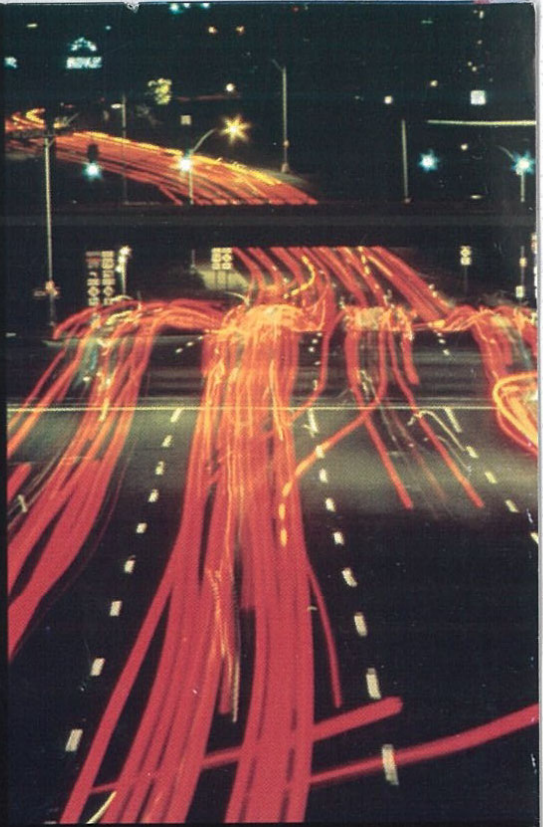
What is the SafeLight citation fee? The fine for running a SafeLight traffic signal is \$50 (set by the State Legislature). If the citation is not paid or appealed within 21 days after the mail date of the citation, then a \$50 late penalty is added to the total cost.

How do I appeal a SafeLight citation? Appeals are heard through an administrative process coordinated by the SafeLight Program. Instructions for filing an appeal are posted on the back of the citation.

Where can I get more information on SafeLight? Call the SafeLight office at 883-9402 or write to SafeLight at 3925 Sedgebrook Street, Suite 103, High Point, NC 27265.

Appendix D. SafeLight Brochure

(4 pages)



SafeLight
Greensboro



Motorists are more likely to be injured in crashes involving red light running than in any other types of urban crashes.

How SafeLight Works

SafeLight detects and automatically photographs cars and trucks that run red lights. If a vehicle enters an intersection while the signal is red, sensors in the pavement trigger nearby cameras to collect three essential photos:

- 1. The first photo, taken of the car outside the intersection, shows that the signal was red as the motorist approached the light.**
- 2. The second photo, taken of the car in the intersection, shows that they did not legally stop.**
- 3. The third photo, taken of the license plate, distinguishes the vehicle. SafeLight cameras are engaged only when the traffic signal is red --during the green and yellow signal phases the system is inactive.**

IT'S WORKING

We have witnessed a reduction in the number of red light running citations at many of our designated intersections. Our numbers indicate that the number of accidents associated with red light camera intersections continues to decrease. It is felt this is the result of increased people's awareness of traffic signals. This continues to support the program objectives of reduced incidents, reduced accidents and increased public awareness. Following the completion of three full years of data collection, the program will be evaluated to determine the effectiveness of the program.





Q & A

Frequently Asked Questions & Answers About Red Light Enforcement



Q: *What is red light running?*

A: A violation occurs when a motorist enters an intersection (often deliberately) some time after the signal light has turned red. Motorists inadvertently in an intersection when the signal changes to red — when waiting to turn, for example — aren't red light runners.

Q: *Is red light running a big problem?*

A: Red light running has been identified by many law enforcement agencies as a preventable traffic safety concern. Red light camera programs have provided one positive solution to this problem. In 2001, the Red Light Camera Program issued over 29,000 citations for the City of Greensboro. Our police department issued 1104 tickets for red light running as well as 441 tickets for accidents related to red light running. Nationally, drivers who run red lights are responsible for an estimated 260,000 crashes each year, of which about 750 are fatal.

Q: *Isn't conventional police enforcement sufficient?*

A: Greensboro, like most major cities, must make a conscious effort to place its manpower where it is needed the most and supplement areas with unique alternatives. As with the case of red light running, the presence of red light cameras at critical intersections allows valued resources to be moved to other sensitive police matters without a loss in service and effectiveness.

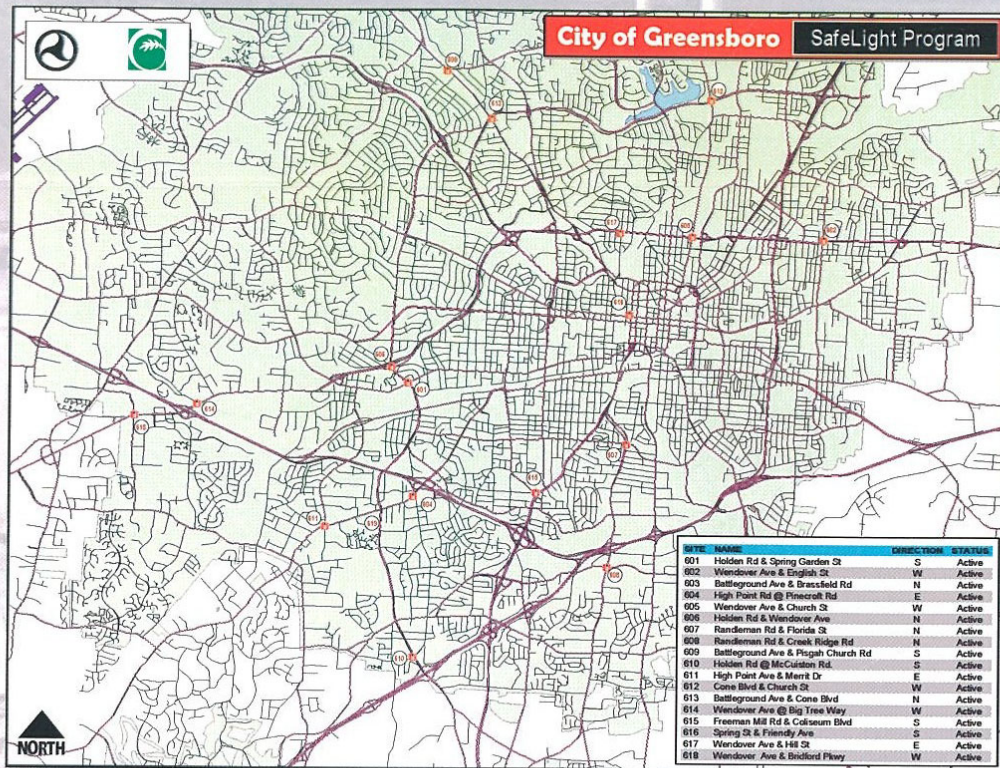
Q: *Do the cameras photograph every vehicle passing through an intersection?*

A: No. The cameras are set so only those vehicles that enter an intersection after the light has turned red are photographed. Vehicles that enter on yellow and are still in an intersection when the light changes to red aren't photographed. SafeLight catches vehicles driven by motorists who enter an intersection after the signal has turned red.

Q: *Do red light cameras violate motorists' privacy?*

A: No. Driving is a regulated activity on public roads. By obtaining a license, a motorist agrees to abide by certain rules — to obey traffic signals, for example. Neither the law nor common sense suggests drivers shouldn't be observed on the road or have their violations documented. In addition, our red light camera systems photograph only a vehicle's rear license plate — not the vehicle's occupants. Only the vehicles driven by motorists who are violating the law are photographed.





SafeLight

CONTACT US

By Mail: P.O. Box 3136 Greensboro, NC 27402-3136

By E-mail: gdot@ci.greensboro.nc.us

By Phone: City Hall (336) 373-2332

Transportation Operations (336) 373-2569

Parking Operations (336) 373-2332

Transit Authority (336) 373-2634

**Appendix E. North Carolina General Statutes:
Chapter 160A-300.1**

(2 pages)

§ 160A-300.1. Use of traffic control photographic systems.

(a) A traffic control photographic system is an electronic system consisting of a photographic, video, or electronic camera and a vehicle sensor installed to work in conjunction with an official traffic control device to automatically produce photographs, video, or digital images of each vehicle violating a standard traffic control statute or ordinance.

(b) Any traffic control photographic system or any device which is a part of that system, as described in subdivision (a) of this section, installed on a street or highway which is a part of the State highway system shall meet requirements established by the North Carolina Department of Transportation. Any traffic control system installed on a municipal street shall meet standards established by the municipality and shall be consistent with any standards set by the Department of Transportation.

(b1) Any traffic control photographic system installed on a street or highway must be identified by appropriate advance warning signs conspicuously posted not more than 300 feet from the location of the traffic control photographic system. All advance warning signs shall be consistent with a statewide standard adopted by the Department of Transportation in conjunction with local governments authorized to install traffic control photographic systems.

(c) Municipalities may adopt ordinances for the civil enforcement of G.S. 20-158 by means of a traffic control photographic system, as described in subsection (a) of this section. Notwithstanding the provisions of G.S. 20-176, in the event that a municipality adopts an ordinance pursuant to this section, a violation of G.S. 20-158 at a location at which a traffic control photographic system is in operation shall not be an infraction. An ordinance authorized by this subsection shall provide that:

- (1) The owner of a vehicle shall be responsible for a violation unless the owner can furnish evidence that the vehicle was, at the time of the violation, in the care, custody, or control of another person. The owner of the vehicle shall not be responsible for the violation if the owner of the vehicle, within 30 days after notification of the violation, furnishes the officials or agents of the municipality which issued the citation either of the following:
 - a. An affidavit stating the name and address of the person or company who had the care, custody, and control of the vehicle.
 - b. An affidavit stating that the vehicle involved was, at the time, stolen. The affidavit must be supported with evidence that supports the affidavit, including insurance or police report information.
- (1a) Subdivision (1) of this subsection shall not apply, and the registered owner of the vehicle shall not be responsible for the violation, if notice of the violation is given to the registered owner of the

vehicle more than 90 days after the date of the violation.

- (2) A violation detected by a traffic control photographic system shall be deemed a noncriminal violation for which a civil penalty of fifty dollars (\$50.00) shall be assessed, and for which no points authorized by G.S. 20-16(c) shall be assigned to the owner or driver of the vehicle nor insurance points as authorized by G.S. 58-36-65.
- (3) The owner of the vehicle shall be issued a citation which shall clearly state the manner in which the violation may be challenged, and the owner shall comply with the directions on the citation. The citation shall be processed by officials or agents of the municipality and shall be forwarded by personal service or first-class mail to the address given on the motor vehicle registration. If the owner fails to pay the civil penalty or to respond to the citation within the time period specified on the citation, the owner shall have waived the right to contest responsibility for the violation, and shall be subject to a civil penalty not to exceed one hundred dollars (\$100.00). The municipality may establish procedures for the collection of these penalties and may enforce the penalties by civil action in the nature of debt.
- (4) The municipality shall institute a nonjudicial administrative hearing to review objections to citations or penalties issued or assessed under this section.

(d) This section applies only to the Cities of Albemarle, Charlotte, Durham, Fayetteville, Greensboro, Greenville, High Point, Lumberton, Newton, Rocky Mount, and Wilmington, to the Towns of Chapel Hill, Cornelius, Huntersville, Matthews, Nags Head, Pineville, and Spring Lake, and to the municipalities in Union County. (1997-216, ss. 1, 2; 1999-17, s. 1; 1999-181, ss. 1, 2; 1999-182, s. 2; 1999-456, s. 48(c); 2000-37, s. 1; 2000-97, s. 2; 2001-286, ss. 1, 2; 2001-487, s. 37; 2003-86, s. 1; 2003-380, s. 2.)

**Appendix F. City of Greensboro Ordinance:
Section 16-58**

(2 pages)

AMENDING CHAPTER 16

AN ORDINANCE AMENDING CHAPTER 16 OF THE GREENSBORO CODE OF ORDINANCES WITH RESPECT TO TRAFFIC CONTROL PHOTOGRAPHIC SYSTEMS

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF GREENSBORO:

Section 1. That Sec. 16-58(d) of the Greensboro Code of Ordinances is hereby amended by deleting the sentence in subsection (d) as follows:

"An individual desiring a non judicial hearing must post a bond in the amount of fifty dollars (\$50.00) before a hearing will be scheduled".

Section 2. That Sec. 16-58(d) of the Greensboro Code of Ordinances is hereby amended by adding the following sentences at the end of subsection (d) to read as follows:

"The decision of the hearing officer shall be hand delivered or mailed to the owner or driver of the vehicle. Whenever the decision of the hearing officer upholds the civil penalty violation, the owner or driver of the vehicle shall pay the civil penalty of fifty dollars (\$50.00) within thirty (30) days after the final determination as indicated by the date on the determination".

Section 3. That all laws and clauses of laws in conflict with the provisions of this ordinance are hereby repealed to the extent of such conflict.

Section 4. That this ordinance shall become effective immediately upon its adoption.

Section 6.3 Greensboro City Code

AN ORDINANCE AMENDING CHAPTER 16 OF THE GREENSBORO CODE

WITH RESPECT TO MOTOR VEHICLES AND
TRAFFIC BE IT ORDAINED BY THE CITY
COUNCIL OF THE CITY OF GREENSBORO:

Section 1. That Section 16-1 of the Greensboro Code of Ordinances is amended by adding the following definitions in their respective alphabetical order:

Traffic control photographic system is an electronic system consisting of a photographic, video or electronic camera and a vehicle sensor installed to work in conjunction with an official traffic control device and to automatically pry photographs, video or digital images of each vehicle violating a standard traffic control statute or ordinance.

In operation means operating in good working condition.

System location is the approach to an intersection toward which a photographic, video or electronic camera is directed and is in operation.

Vehicle owner is the person identified by the North Carolina Division of Motor Vehicles as the registered owner of a vehicle."

Section 2. That Chapter 16 of the Greensboro Code of Ordinances is hereby further amended by adding a new section following Section 16-57 to read as follows:

"Sec. 16-58. Traffic control photographic systems

(a) Administration The City of Greensboro shall implement a system for capturing traffic control violations, as defined under G.S. 20-158, with a traffic control photographic system that will use the photographic

images as prima facie evidence of the traffic violations and will authorize the Greensboro Department of Transportation or an agent of the Department to issue civil citations.

The City of Greensboro Department of Transportation shall administer the Traffic Control Photographic Program and shall maintain a list of system locations where traffic control photographic systems are installed.

Any citation for a violation of G.S. 20-158 or other traffic violation, issued by a duly authorized law enforcement officer at a system location shall be trotted, pursuant to G.S. 20-156, as an inaction so long as the system photographic images are not used as prima facie evidence of the violation.

The citation shall clearly state the manner in which the violation may be reviewed. The citation shall be processed by officials or agents of the City of Greensboro and shall be forwarded by personal service or first-class mail to the owner's address as given on the motor vehicle registration

(b) *Offense:*

- (1) It shall be unlawful for a vehicle to cross the stop line at a system location when the traffic signal for that vehicle's direction of travel is emitting a steady red light, or for a vehicle to violate any other traffic regulation specified in G. S.20-158
- (2) The owner of a vehicle shall be responsible for a violation under this section, unless the owner can furnish evidence that the vehicle was in the care, custody, or control of another person at the time of the violation, as described in erection (3).
- (3) Notwithstanding sub section (2) the owner of the vehicle shall not be responsible for the violation if, within twenty-one (21) days after notification of the violation, the owner furnishes the officials or agents of the City:
 - (i) The name and address of the person or entity who leased, rented, or otherwise had the care, custody, and control of the vehicle at the time of the violation; or
 - (ii) An affidavit by the owner stating that, at the time of the violation, the vehicle involved was stolen or was in the care, custody, or control of some person who did not have permission to use the vehicle.

(c) *Penalty:* Any violation of this **section shall be deemed a non-criminal violation for which a civil penalty of fifty dollars (\$50.00) shall be assessed**, and for *which* no points authorized by G.S. 20-16(c) shall be assigned to the owner or driver of the vehicle, nor insurance points as authorized by G.S. 5&36.65. Failure to pay the civil penalty or to respond to the citation within twenty-one (21) days shall constitute a waiver of the right to contest responsibility for the violation and shall subject the owner to a civil penalty not to exceed one hundred dollars (\$ 100.00). The City shall establish procedures for the collection of the civil penalties and shall enforce the penalties **by a civil action in the nature of a debt.**

(d) *Non-judicial administrative raring:* The City of Greensboro Department of Transportation shall establish an administration process to review objections to citations ex penalties issued or assessed. A notice requesting a hearing to review objections shall be file within twenty-one (21) days after notification of the violation. An **individual** desiring a non-judicial **hearing must post a bond** in the amount of \$50.00 before a hearing will be scheduled. The **determination of the hearing officer will be final.**"

Section 3. That this ordinance shall become effective *on March 1, 2000.*

Section 4. That all laws and clams of laws in conflict with the provision of **this** ordinance are hereby repealed to the extent of such conflict.